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PROCEEDINGS OF A CONFERENCE OF GOVERNORS

IN THE WHITE HOUSE
WASHINGTON, D. C.
MAY 13-15, 1908

EDITED UNDER THE DIRECTION OF

NEWTON C. BLANCHARD, Chairman
JOHN FRANKLIN FORT JAMES O. DAVIDSON
JOHN C. CUTLER MARTIN F. ANSEL

THE COMMITTEE OF GOVERNORS

By W J McGee
RECORDING SECRETARY OF THE CONFERENCE

PUBLISHED BY AUTHORITY OF CONGRESS

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CHICAGO, ILLINOIS

Washington
Government Printing Office
1909

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Concurrent Resolution 41, Sixtieth Congress, first session, introduced by Hon. Albert F. Dawson May 11, 1908 (Cong. Rec., p. 6109), agreed to after amendment by the House of Representatives May 26 (Cong. Rec., p. 7009), and agreed to by the Senate May 27 (Cong. Rec., p. 7018):

Resolved by the House of Representatives (the Senate concurring), That there be printed and bound fifty thousand copies of the Proceedings of the Conference of the Governors of the States and Territories, called by the President of the United States, to be held May thirteenth, fourteenth, and fifteenth, nineteen hundred and eight, to consider measures for the conservation of the country's natural resources, of which fourteen thousand copies shall be for the use of the Senate and twenty-six thousand copies for the use of the House of Representatives, and ten thousand copies for distribution by the President of the United States.

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ORIGIN AND PLAN OF THE CONFERENCE

The idea of conserving the Nation's resources arose partly from the recent forestry movement, partly from the still more recent waterway movement.

The germ of the idea took form in an address by President Roosevelt before the Society of American Foresters (of which he was and is an associate member), March 26, 1903. In expressions indicating perhaps more clearly than any of earlier date the interdependence of our resources, he said to the forest students:

> Your attention must be directed to the preservation of the forests, not as an end in itself, but as a means of preserving the prosperity of the Nation. * * * In the arid region of the West agriculture depends first of all upon the available water supply. In such a region forest protection alone can maintain the stream flow necessary for irrigation and can prevent the great and destructive floods so ruinous to communities farther down the same streams. * * * The relation between forests and the whole mineral industry is an extremely intimate one. The very existence of lumbering * * * depends upon the success of our work as a Nation in putting practical forestry into effective operation. As it is with mining and lumbering, so it is in only a less degree with transportation, manufactures, and commerce in general. The relation of all these industries to forestry is of the most intimate and dependent kind.

With continued development of the forest policy the interdependence of woodlands and waterways yearly became more evident; and it also became increasingly clear that both woods and waters are in their industrial aspects closely related not only to mineral production and the reclamation of arid lands but to all agriculture and to transportation.

The next formal expression appeared when the President, in response to petitions of the People of the Interior, appointed the Inland Waterways Commission. In the letter creating the Commission he declared:

> It is becoming clear that our streams should be considered and conserved as great natural resources. * * * The time has come for merging local projects and uses of the inland waters in a comprehensive plan designed for the benefit of the entire country. * * * It is not possible to properly frame so large a plan * * * without taking account of the orderly development of other natural resources. Therefore, I ask that the Inland Waterways Commission shall consider the relations of the streams to the use of all the great permanent natural resources and their conservation for the making and maintenance of prosperous homes.

While the foregoing expressions indicated both the relations among the Nation's resources and the need for a wider utilization of them, they did little more than forecast a National duty. Conservation as a single problem and as a basis for National policy was outlined still more clearly in the President's address before the National Editorial Association in Jamestown, June 10, 1907, the tenor of which appears in the following passages:

> In utilizing and conserving the natural resources of the Nation, the one characteristic more essential than any other is foresight. * * * No other Nation enjoys so wonderful a measure of present prosperity, which can of right be treated as an earnest of future success, and for no other are the rewards of foresight so great, so certain, and so easily foretold. Yet hitherto as a Nation we have tended to live with an eye single to the present, and have permitted the reckless waste and destruction of much of our National wealth.
>
> The conservation of our natural resources and their proper use constitute the fundamental problem which underlies almost every other problem of our National life. Unless we maintain an adequate material basis for our civilization, we can not maintain the institutions in which we take so great and so just a pride; and to waste and destroy our natural resources means to undermine these material bases. * * *
>
> So much for what we are trying to do in utilizing our public lands for the public; in securing the use of the water, the forage, the coal, and the timber for the public. In all four movements my chief adviser, and the man first to suggest to me the courses which have actually proved so beneficial, was Mr Gifford Pinchot, the Chief of the National Forest Service. Mr Pinchot also suggested to me a movement supplementary to all of these movements, one which will itself lead the way in the general movement which he represents and with which he is actively identified, for the conservation of all our natural resources. This was the appointment of the Inland Waterways Commission.

On May 14–23, 1907, the Inland Waterways Commission, while engaged in an inspection trip along the lower Mississippi at high-water stage, repeatedly discussed the policy of Conservation in its bearing on the general plans for waterway improvement toward which they were at work; and at their Fifteenth Session, on May 21 (aboard the steamer *Mississippi*), it was decided—subject to approval by the President—to hold a conference or convention in Washington during the ensuing winter to discuss the conservation of the Nation's resources. Chairman Burton was formally authorized to issue to the press a brief statement framed by Vice-Chairman Newlands, and the chairman and Commissioner Pinchot were made a committee to convey the matter "to the President as an expression of the view of the Commission, leaving him to decide how the call shall issue." Soon afterward this committee conferred informally with the President, and received his sanction for arranging such a meeting.

During ensuing months Commissioners Newlands, Pinchot, Newell, and McGee met on the Pacific coast, partly for the purpose of examining waterways and partly to consider and arrange details of the proposed assembly. Just before the opening of the Fifteenth Session of the National Irrigation Congress at Sacramento, early in September, a preliminary draft of programme was put in writing and sent to Chairman Burton. This draft corresponded closely in topics, speakers, and other details with the calendar subsequently adopted, except that up to this time the conference was designed primarily as one of experts rather than of statesmen.

At Sacramento it was learned by one of the commissioners present that the Lakes-to-Gulf Deep Waterway Association, then arranging for their Memphis convention, expected to bring together a score or more of State executives; and the suggestion was offered that, if the five Governors attending the Irrigation Congress should approve, it might be well to invite the State executives of the entire country to take part in the proposed conference in Washington. Senator Newlands, as Vice-Chairman of the Commission, at once acted on the suggestion by inviting Governors Gillett, Chamberlain, Mead, Cutler, and Kibbey to meet the four commissioners present and discuss the matter. All accepted except Governor Gillett, who had a conflicting engagement, but signified general approval. At the meeting the idea of Conservation in its relations to waterway improvement was outlined, together with the plan for the conference so far as developed; and in the course of discussion the further idea was brought out more clearly than before that the State Governor is of necessity the chief sponsor for the welfare of his commonwealth. Soon as suggested, this idea modified the plan for the meeting, and led to the decision that it should be primarily a Conference of Governors, and only secondarily a meeting of experts able authoritatively to convey information both to the Governors and to the Commission. The four Governors present signified full approval of the plan and the determination to take part in the Conference, Governor Chamberlain observing that he had already contemplated and even suggested meetings of Governors for the discussion of interstate questions.

The outcome of the Sacramento meeting and the progress in the preparation of plans for the Conference were informally communicated to the President, and in the draft of his Memphis address before the Lakes-to-Gulf Deep Waterway Association, prepared in advance for the press, he incorporated the announcement that the Inland Waterways Commission would, with his full approval, call a Conference of Governors and experts on the conservation of natural resources, to be held in Washington early in the ensuing winter. The announcement in this form was extensively published immediately after the delivery of the address on October 4.

Meantime the Commission was again engaged in an inspection trip down the Mississippi from St. Paul to Memphis at the low-water stage, in which the President took part October 1–4, passing from Keokuk to Memphis amid an ovation unparalleled in the history of the Interior. At the Twenty-third Session of the Commission, on October 3, presided over by the President, it was decided to make the arrangements for the Conference a matter of record through a formal letter. This letter was drafted later in the day; and out of consideration for the score of Governors who were assembled on a neighboring vessel as guests of the Business Men's League of St. Louis, the Commissioners met them on board their vessel and invited them to join in the request to the President that he authorize and formally announce the Conference. Through a natural delicacy, several of the Governors expressed the feeling that it would be better for the plan to originate wholly with the Commission; and accordingly on the morning of October 4 the following written communication was conveyed to the President:

OCTOBER 3, 1907.

The PRESIDENT,
On board the U. S. Steamer Mississippi.

SIR: In the course of inquiries made under your direction "that the Inland Waterways Commission shall consider the relations of the streams to the use of all the great permanent natural resources and their conservation for the making and maintenance of prosperous homes," the members of the Commission have been led to feel that it would be desirable to hold a Conference on the general subject of the conservation of the natural resources of the Nation.

Among the reasons for such a Conference are the following:

1. Hitherto our National policy has been one of almost unrestricted disposal of natural resources, and this in more lavish measure than in any other nation in the world's history; and this policy of the Federal Government has been shared by the constituent States. Three consequences have ensued: First, unprecedented consumption of natural resources; second, exhaustion of these resources, to the extent that a large part of our available public lands have passed into great estates or corporate interests, our forests are so far depleted as to mulitply the cost of forest products, and our supplies of coal and iron ore are so far reduced as to enhance prices; and third, unequalled opportunity for private monopoly, to the extent that both the Federal and the State sovereignties have been compelled to enact laws for the protection of the People.

2. We are of opinion that the time has come for considering the policy of conserving these material resources on which the permanent prosperity of our country and the equal opportunity of all our People must depend; we are also of opinion that the policy of conservation is so marked an advance on that policy adopted at the outset of our National career as to demand the consideration of both Federal and State sponsors for the welfare of the People.

3. We are of opinion that the Conference may best be held in the National Capital next winter, and that the conferees should comprise

the Governors of all our States and Territories, a limited number of delegates to be appointed by each Governor, and representatives from leading organizations of both State and National scope engaged in dealing with National resources or with practical questions relating thereto.

We have the honor to ask that in case you concur in our view you call such a Conference.

Respectfully submitted.

(Signed) THEODORE E. BURTON,
Chairman.
(Signed) W J McGEE,
Secretary.

On receiving the communication, the President not merely approved the plan but decided to comply fully with the formal request of the Commission and himself call the Conference; and he so announced in his Memphis address delivered later in the day, as follows:

> As I have said elsewhere, the conservation of natural resources is the fundamental problem. Unless we solve that problem it will avail us little to solve all others. To solve it, the whole nation must undertake the task through their organizations and associations, through the men whom they have made specially responsible for the welfare of the several States, and finally through Congress and the Executive. As a preliminary step, the Inland Waterways Commission has asked me to call a conference on the conservation of natural resources, including, of course, the streams, to meet in Washington during the coming winter. I shall accordingly call such a conference. It ought to be among the most important gatherings in our history, for none have had a more vital question to consider.

At the Twenty-fifth Session of the Commission, convened on October 5, a Conference Committee was appointed "to confer with the President and take requisite action in conformity with his wishes" regarding arrangements; the Committee comprising Commissioners Pinchot (chairman), Newell, and McGee. About this time it was decided, at the instance of Commissioner Newell, to recommend to the President that the Conference be held in the East Room of the White House; and the recommendation was promptly approved. This Conference Committee kept in communication with the President, and reported progress at several sessions of the Commission.

In November, the President wrote each Governor, inviting him to take part in the Conference; one of the letters being as follows:

> MY DEAR GOVERNOR: The natural resources of the United States were, at the time of settlement, richer, more varied, and more available than those of any other equal area on the earth. The development of these resources has given us for more than a century a rate of increase of population and wealth without parallel in history. It is obvious that the prosperity which we now enjoy rests directly upon these resources. It is equally obvious that the vigor and success which we desire and

foresee for this nation in the future must have this as its ultimate material basis.

In view of these evident facts, it seems to me time for the country to take account of its natural resources and to inquire how long they are likely to last. We are prosperous now; we should not forget that it will be just as important to our descendants to be prosperous in their time.

Recently I declared there is no other question now before the nation of equal gravity with the question of the conservation of our natural resources, and I added that it is the plain duty of us who, for the moment, are responsible to take inventory of the natural resources which have been handed down to us, to forecast the needs of the future, and so handle the great sources of our prosperity as not to destroy in advance all hope of the prosperity of our descendants.

It is evident the abundant natural resources on which the welfare of this nation rests are becoming depleted, and, in not a few cases, are already exhausted. This is true of all portions of the United States; it is especially true of the longer settled communities of the East.

The gravity of the situation must, I believe, appeal with special force to the Governors of the States, because of their close relations to the people and the responsibility for the welfare of their communities. I have therefore decided, in accordance with the suggestion of the Inland Waterways Commission, to ask the Governors of the States and Territories to meet at the White House on May 13, 14, and 15 to confer with the President and with each other upon the conservation of natural resources.

It gives me great pleasure to invite you to take part in this Conference. I should be glad to have you select three citizens to accompany you and to attend the Conference as your assistants or advisers. I shall also invite the Senators and Representatives of the Sixtieth Congress to be present at the sessions so far as their duties will permit.

The matters to be considered at this conference are not confined to any region or group of States, but are of vital concern to the Nation as a whole and to all the people. Those subjects include the use and conservation of the mineral resources, the resources of the land, and the resources of the waters in every part of our territory.

In order to open discussion, I shall invite a few recognized authorities to present brief descriptions of actual facts and conditions, without argument, leaving the conference to deal with each topic as it may elect. The members of the Inland Waterways Commission will be present in order to share with me the benefit of information and suggestion, and, if desired, to set forth their provisional plans and conclusions.

Facts, which I can not gainsay, force me to believe that the conservation of our natural resources is the most weighty question now before the people of the United States. If this is so, the proposed conference, which is the first of its kind, will be among the most important gatherings in our history in its effect upon the welfare of all our people.

I earnestly hope, my dear Governor, that you will find it possible to be present.

Sincerely yours,

(Signed) THEODORE ROOSEVELT.

All the Governors of the States and Territories accepted, a few conditionally on grounds of health or pressure of public affairs.

In December and later the President issued invitations to organizations dealing with natural resources, which were generally accepted. One of these was as follows:

> My Dear Sir: Recently I invited the Governors of the States and Territories to meet in the White House on May 13–15 next in a Conference on the Conservation of Natural Resources. In issuing the invitation, I expressed the opinion that there is urgent need of taking stock of our resources, and I added my belief that the Conference ought to take rank among the more important meetings in the history of the country.
>
> The replies to the invitation have been most gratifying. They indicate that practically all of the Governors, each with three special advisers, will attend the Conference. The Senators and Representatives of the Sixtieth Congress, the Justices of the Supreme Court, and the members of the Cabinet have also been invited to take part; and the Inland Waterways Commission, which suggested the Conference, will be present to reply to inquiries and make record of the Proceedings. A limited number of leading associations of national scope concerned with our natural resources will be invited to send one representative each to take part in the discussions. The general purpose of the Conference is indicated on pages 24–26 of the preliminary report of the Waterways Commission, of which a copy is inclosed.
>
> I invite the cooperation of the American Society of Mechanical Engineers in bringing this matter before the people; and it gives me added pleasure to invite you as President of the Society to take part in the Conference.
>
> Sincerely yours,
>
> (Signed) Theodore Roosevelt.

Meantime correspondence was conducted with experts by the President or his Secretary, and also by the Conference Committee; and a Syllabus was prepared for the guidance of experts in the preparation of opening statements. This Syllabus is printed on later pages.

In the course of the correspondence, the President invited as special guests five eminent citizens widely recognized as authorities on national aspects of the resources of the country.

As the plans for the Conference grew definite, early in the correspondence, and it became clear that the statements and deliberations of the Governors and other Conferees might assume such importance as to be of interest to the coordinate branches of the Federal Government, the Justices of the Supreme Court and the Senators and Representatives of the Sixtieth Congress were invited by the President to take part. Similar invitations were extended also to members of the Cabinet.

Throughout it was planned to provide for press attendance in the interests of the public and to prevent possible misapprehension of purpose; and as the time for the Conference approached it was decided to invite representatives of the periodical press as well as the daily press. The former, coming from different parts of the country, were personally invited by the President, after selection by the Periodical Publishers Association; the latter (forty in number) were selected by the managing committee of the Congressional Press Gallery from the Washington representatives of the leading papers and entered on personal recognition and press badges, under regulations of their committee.

Finally, toward the end of April, a limited number of bureau chiefs and other experts of national reputation connected with the Federal service were invited by the President to take part in the Conference; and these invitations, like all others, were generally accepted.

Early in May the Calendar of the Conference was prepared, chiefly for the convenience of the Governors and subject to change by them after assembling; in its final form it is reprinted on later pages. Although not designed as a fixed programme, its order was found convenient and was followed somewhat closely, except on the last day of the Conference.

The Conference Committee kept in close touch with the arrangements, including provision for the safety of the unprecedented assemblage of public officials; they were aided efficiently by Mr Thomas R. Shipp, who was made General Secretary of the Conference, the Secretary of the Commission acting as Recording Secretary. (During the second session, Governor John Burke, of North Dakota, was chosen Honorary Secretary.)

A few Governors were kept away by illness or special pressure of public business. As the date for the Conference approached there were a number of changes among the Governors' advisors, with a few among the representatives of organizations; while of the five special guests invited by the President, one—Ex-President Cleveland—was confined to his home by illness which soon after proved fatal.

The Roster on later pages comprises the Conferees (including Governors prevented by illness or public duty from appearing in person), arranged by groups. The half-tone engraving following it represents the Governors present at noon of May 13, with several other guests. A photogravure representing all the Conferees was prepared with the consent of the Conference Committee, but is not reproduced herein. W J M.

SYLLABUS

MINERAL RESOURCES—

MINERAL FUELS:

a. Coal fields of the United States, including (1) extent, (2) varieties, (3) amount, (4) production, and (5) value.

b. Methods of mining.

c. Rates of use and probable duration of (1) anthracite, (2) coking bituminous, (3) ordinary bituminous, (4) lignite, and (5) cannel coal.

d. Losses in mining and waste in use in connection with power, heating, smelting, and gas production.

e. Estimated duration of present methods of mining and use, classed by kinds and fields.

f. Influence of progressive exhaustion on current prices.

g. Improvements in mining and use, and their estimated effects in prolonging supply.

h. Connection between coal production and transportation, including (1) price, (2) rate of output, and (3) exhaustion of fields.

i. Relation between coal and other resources, including (1) substitution of water-power for fuel-power, (2) saving (in both power and smelting) through substitution of water carriage for rail carriage, and (3) saving through substitution of gas motors for steam-engines.

j. Petroleum and rock gas.

k. Possible substitutes for fuel.

ORES AND RELATED MINERALS:

a. Mineral production in the United States, including (1) iron, (2) copper, (3) gold, (4) silver, (5) other metals, (6) cement, (7) brick-clay, (8) stone, and (9) miscellaneous.

b. Relation between production and price.

c. Estimates of (1) available quantity, (2) prospective cost of production and price, and (3) duration of supply.

d. Processes of mining and quarrying, including (1) growth and improvement, (2) prospective improvement, and (3) possibilities of reducing waste.

e. Relation between ores and other resources.

f. Probable consequences of exhaustion of standard minerals, including (1) iron, (2) copper, and (3) gold.

LAND RESOURCES—

SOIL:

a. Origin of the soil and its relations to underlying rocks.

b. Natural products of the soil and adjustment of soil and products to rains and running waters.

c. Progressive enrichment of soils under natural conditions.

d. Effects of cultivation in (1) impoverishing and (2) enriching soils.

e. Soil erosion, including (1) amount, (2) direct loss involved, (3) indirect losses due to scouring of channels, deposition of débris on bottom-lands, building of sand bars, diversion of streams, and (4) means of prevention.

f. General estimates of loss to the country through needlessly reduced fertility and decreased production.

LAND RESOURCES—Continued.

FORESTS:

- *a.* Extent of primeval woodlands in the United States.
- *b.* Early use and destruction, when forests were regarded as obstructions to settlement.
- *c.* Use and destruction with increasing settlement, including losses by (1) waste and (2) fires.
- *d* Present extent and value of forests.
- *e.* Rate of consumption and increasing cost of and demand for forest products.
- *f.* Estimated duration of forests and prospective prices of forest products.
- *g.* Relations between forests and other resources, including (1) mineral fuels, (2) iron and copper, (3) building stone, brick-clay, cement materials, etc.
- *h.* Direct influence of forests on (1) soil and mulch, (2) stream-flow, (3) ground water and springs, and (4) the clarity and purity of rivers.
- *i.* Direct influence of forests on (1) floods and low waters, (2) power, and (3) community water supply.
- *j.* Indirect influence of forests on waterway improvement and navigation.
- *k.* Relation between forest control and (1) crop production, (2) commerce, and (3) population.

SANITATION:

- *a.* Development of systems of community water supply, (1) past, and (2) present.
- *b.* Methods and extent of the securing of community water supply in this and other countries.
- *c.* Relation between purity and clarity of water for community supply.
- *d.* Mortality and disease due to impure water supply, with estimated loss to communities and the country.
- *e.* Diminution in rate of increase in population and production by reason of impure water supply for communities.
- *f.* Increase in loss from impure water supply attending growth in population and industries.
- *g.* Action required in the interests of the public health.

RECLAMATION:

- *a.* Extent of arid and semi-arid regions.
- *b.* Development of irrigation, (1) private and corporate, (2) State, and (3) National.
- *c.* Extent of irrigation, (1) present, and (2) prospective.
- *d.* Growth of concepts concerning water rights and water as a basis of property.
- *e.* Influence of irrigation on (1) production, (2) commerce, and (3) population.
- *f.* Influence of irrigation on the consumption of water and other resources.
- *g.* Reclamation and stream control by drainage.
- *h.* Extent of swamp and overflow lands and increased value available by drainage, protection, and flood prevention.
- *i.* Influence of drainage and flood prevention on navigation, production, and population.

LAND LAWS:

- *a.* Early policy of land disposal.
- *b.* Transfer of lands under State charters, by special grants, and otherwise

LAND RESOURCES—Continued.

LAND LAWS—Continued.

c. Development of land laws, through (1) squatter sovereignty, (2) land surveys, (3) entry, (4) homesteading, (5) timber claim, (6) stone and mineral claim, etc.

d. Effect of special land laws on settlement, production, and population, including (1) war and other land scrip, (2) railway and other land grants, (3) the lieu land law, (4) timber and stone act, etc.

e. Effect of creation of national forests, parks, and other reserves.

f. Tendency toward large holdings and their influence on production and population.

g. Relative benefits of tenantry and freehold systems.

h. Advantages of making this a nation of homes and home owners.

i. State and Federal action required.

j. Prospective influence on production, commerce, and the conservation of resources.

GRAZING AND STOCK RAISING:

a. Development of grazing and stock raising in the United States, including (1) home pasturing, (2) breeding, and (3) herding.

b. Extent and value of the industries.

c. Grazing in the arid and semi-arid regions, considered with reference to stock, including (1) cattle, (2) sheep, (3) goats, (4) horses and mules, and (5) miscellaneous stock.

d. Methods and results, including (1) selection of stock, (2) breeding, (3) handling, and (4) marketing, with (5) capital, (6) prices, and (7) profits and losses.

e. Bearing of land laws on stock industries.

f. Comparative cost and profit of grazing and other industries in different regions.

g. Influence of stock raising on (1) pasturage, (2) conservation of soil, (3) growth and use of forests, (4) farming, (5) prevention of floods and maintenance of stream flow, and (6) rate of settlement.

h. Relation between stock raising and commerce.

WATER RESOURCES—

RELATIONS BETWEEN RAIL AND WATER TRANSPORTATION:

a. Growth of transportation in the United States.

b. Rail transportation, including (1) number, distribution, and extent of systems, (2) cost and present value, (3) traffic and earnings, (4) capacity, (5) prospective capacity required in different sections, (6) estimated cost of increasing railways to meet prospective requirements, and (7) estimated prospective cost of traffic.

c. Water transportation, including (1) general statement of present facilities, (2) cost of water traffic, (3) pressing lines of development, and (4) influence of water traffic on rail traffic.

d. Terminals and their control.

e. Relations between railway agencies and waterway agencies, including (1) competition, (2) cooperation, and (3) regulation by business interests or by law.

f. Necessity for waterway development to meet transportation requirements, as viewed by railway interests.

g. Influence of cheapened transportation on production.

WATER RESOURCES—Continued.

NAVIGATION:

- *a.* Development of navigation in the United States, including (1) navigation and commerce on rivers, bays, and lakes, (2) canal navigation and commerce, and (3) maritime commerce.
- *b.* Present water transportation systems.
- *c.* Cost of water transportation, absolute and relative.
- *d.* Modern decline of water transportation.
- *e.* Utilization of waterways for (1) navigation, (2) power, (3) community supply, and (4) irrigation.
- *f.* Influence of navigation on production and the use of other resources, including (1) reduced consumption of coal and wood, (2) reduced consumption of iron, and (3) increased production of crops through cheapened traffic.

POWER:

- *a.* Development of the use of water power, including (1) local use of small streams, (2) local use of large streams, and (3) extension and use through electric transmission.
- *b.* Applications of power, in (1) milling, (2) general manufacturing, (3) lighting and heating, and (4) propulsion.
- *c.* Amount and cost of power in use in the United States, including (1) fuel-power, (2) water power, and (3) power from other sources.
- *d.* Rate of increase in the use of power, (1) past, and (2) prospective.
- *e.* Current and prospective electrification of railways, including (1) cost of substitution, and (2) economy of operation.
- *f.* Electric propulsion of water craft.
- *g.* Applicability of electrically transmitted power for shifting cargoes, operating terminals, etc.
- *h.* Use of water power on electrified railways, including estimates of (1) cost of application, (2) economy of operation, (3) saving in consumption of fuel, (4) saving in traffic, and (5) saving in plant, trackage, and rolling stock.
- *i.* Influence of the utilization of water power directly on the consumption of fuels and indirectly on the consumption of iron, copper, and other resources.
- *j.* Estimated amount and cost of development of water power in the United States.

CONSERVATION AS A NATIONAL POLICY—

- *a.* Unity of American interests.
- *b.* Interdependence of industries, especially (1) production (2) manufactures, and (3) commerce, including transportation.
- *c.* Natural bases of national development, (1) past, and (2) prospective.
- *d.* Forecast of future population, production, commerce, and wealth, in the light of international and historical relations.

CALENDAR

This is primarily a conference of the Governors of the United States. In the interests of convenience, sessions have been arranged; and to bring out facts relating to the leading resources and start discussion along useful lines, the sessions will be opened with brief formal statements, limited to twenty minutes each. It is suggested that discussion be withheld at each session until the opening statements have been completed; and that the first opportunity for discussion be accorded to the Governors present.

MAY 12

7.45 p. m.—Meeting of the Governors and special guests with the President at dinner in the White House.

MAY 13

10.00 a. m.—Assembling of Governors and their Advisors with other Conferees in the East Room.

11.00 a. m.—Address by the President:

Conservation as a National Duty.

2.30 p. m.—Session on Mineral Resources

Opening Statements:

The Conservation of Ores and Related Minerals, by Andrew Carnegie
The Waste of Our Fuel Resources, by Dr I. C. White.
General Discussion, opened by John Mitchell.

7.30 p. m.—Meeting of Governors as guests of the Washington Board of Trade at dinner in the New Willard Hotel.

MAY 14

10.00 a. m.—Session on Land Resources.

Opening Statements:

The Natural Wealth of the Land and its Conservation, by James J. Hill.
Soil Wastage, by Professor T. C. Chamberlain.
Forest Conservation, by R. A. Long
General Discussion.

2.30 p. m.—Session on Land Resources.

Opening Statements:

Resources related to Irrigation, by Ex-Governor George C. Pardee
Grazing and Stock Raising, by Hon. H. A. Jastro.
General Discussion, opened by Ex-Senator Carey.

9.00 p. m.—Reception to meet the Governors and the Inland Waterways Commission at the residence of Mr Gifford Pinchot, 1615 Rhode Island Avenue.

MAY 15

10.00 a. m.—Session on Water Resources.

Opening Statements:

Conservation of Life and Health by Improved Water Supply, by Dr George M. Kober.

Navigation Resources of American Waterways, by Professor Emory R. Johnson.

Conservation of Power Resources, by H. S. Putnam

General Discussion.

2.30 p. m.—General Session.

4.00 p. m.—Mrs Roosevelt's Garden Party to the members of the Conference and their ladies, in the White House grounds.

ROSTER

PRESIDENT

Hon. Theodore Roosevelt.

VICE-PRESIDENT

Hon. Charles W. Fairbanks.

CABINET[a]

Hon. Elihu Root, Secretary of State.
Hon. George B. Cortelyou, Secretary of the Treasury.
Hon. Charles J. Bonaparte, Attorney-General.
Hon. George von L. Meyer, Postmaster-General.
Hon. James R. Garfield, Secretary of the Interior.
Hon. James Wilson, Secretary of Agriculture.
Hon. Oscar S. Straus, Secretary of Commerce and Labor.

SUPREME COURT

Mr Chief Justice Fuller.
Mr Justice Harlan.
Mr Justice Brewer.
Mr Justice White.
Mr Justice Peckham.
Mr Justice McKenna.
Mr Justice Holmes.
Mr Justice Day.
Mr Justice Moody.

THE CONGRESS[b]

GOVERNORS AND THEIR ADVISORS

Alabama:
  Governor B. B. Comer.
    Hon. R. M. Goodall, Birmingham.
    Hon. F. M. Jackson, Birmingham.
    Hon. W. F. Tebbetts, Mobile.

---

[a] Hon. William H. Taft, Secretary of War, was in Panama on emergency duty, and Hon. Victor H. Metcalf, Secretary of the Navy, was on the Pacific coast in connection with the special movement of the American Battle-ship Fleet.

[b] Each Senator and Representative in the Sixtieth Congress, first session, was invited to the Conference, and most accepted, subject to public demands in the session then drawing to a close; many were in attendance at each session, being received specially and ushered into the East Room by a Doorkeeper of the House.

Alaska (Territory of):
    Governor Wilford B. Hoggatt.
        Major W. P. Richardson, U. S. Army, Skagway.
        Mr Stephen Birch, Valdez.
Arizona (Territory of):
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        Hon. B. A. Fowler, Phoenix.
        Hon. Dwight B. Heard, Phoenix.
        Hon. W. F. Nichols, Willcox.
Arkansas:
    Acting Governor X. O. Pindall.
        Mr H. M. Armistead, Little Rock.
        Mr H. L. Ponder, Walnut Ridge.
        Mr Sid B. Redding, Little Rock.
California:
    Governor James N. Gillett (absent).
        Mr Arthur R. Briggs, San Francisco
        Mr Frank H. Short, Fresno.
Colorado:
    Governor Henry A. Buchtel.
        Hon. Earle M. Cranston, Denver.
        Mr William L. Hartman, Pueblo.
        Mr Thomas W. Jaycox, Leadville.
Columbia (District of):
    Hon. H. B. F. Macfarland, President, Board of Commissioners.
Connecticut:
    Governor Rollin S. Woodruff.
        Hon. Charles Hopkins Clark, Hartford.
        Dr Arthur T. Hadley, New Haven.
        Colonel Norris G. Osborn, New Haven.
Delaware:
    Governor Preston Lea.
        Judge George Gray, Wilmington.
        Mr Benjamin Nields, Wilmington.
        Hon. James Pennewill, Dover.
Florida:
    Governor Napoleon B. Broward (absent).
        Mr George F. Miles, St. Augustine.
        Senator W. H. Milton, Mariana.
        Mr E. H. Sellards, Tallahassee.
Georgia:
    Governor Hoke Smith (absent).
        Mr John H. Finney, Atlanta.
        Mr Carleton B. Gibson, Columbus.

Hawaii (Territory of):
- Governor Walter F. Frear.
  - Mr Alonzo Gartley.
  - Mr Ralph S. Hosmer.
  - Mr William O. Smith.

Idaho:
- Governor Frank R. Gooding.
  - Hon. Fentress W. Hill, Twin Falls.
  - Hon. E. M. Hoover, Boise.
  - Hon. F. F. Johnson, Wallace.

Illinois:
- Governor Charles S. Deneen.
  - Mr Lyman E. Cooley, C. E., Chicago.
  - Dr Edmund J. James, Champaign.
  - Mr Isham Randolph, C. E., Chicago.

Indiana:
- Governor J. Frank Hanly.
  - Hon. Joseph D. Oliver, South Bend.
  - Hon. Frank B. Posey, Evansville.
  - Mr Henry Riesenberg, Indianapolis.

Iowa:
- Governor Albert B. Cummins (absent).
  - Mr George C. Call, Sioux City.
  - Mr I. M. Earle, Des Moines.
  - Mr William Louden, Fairfield.

Kansas:
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  - Mr John E. Frost, Topeka.
  - Mr John Powers, Marion.
  - Mr Eugene F. Ware, Kansas City.

Kentucky:
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  - Mr John B. Atkinson, Earlington.
  - Colonel Andrew Cowan, Louisville.
  - Mr J. W. Porter, Lexington.

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  - Hon. E. H. Farrar, New Orleans.
  - Mr Thomas J. Kernan, Baton Rouge.
  - Mr John M. Parker, New Orleans.

Maine:
- Governor William T. Cobb (absent).
  - Ex-Governor John F. Hill, Augusta.
  - Professor Austin Cary, Brunswick.
  - Hon. Edgar E. Ring, Orono.

Maryland:
- Governor Austin L. Crothers (absent).
  - Mr Bernard N. Baker, Baltimore.
  - Dr William Bullock Clark, Baltimore.
  - Mr Edward Hirsch, Baltimore.

Massachusetts:
- Governor Curtis Guild, Jr. (absent).
  - Professor Kenyon L. Butterfield, Amherst.
  - Professor Frank W. Rane, Boston.
  - Professor George F. Swain, Boston.

Michigan:
- Governor Fred M. Warner.
  - Dr James B. Angell, Ann Arbor.
  - Mr Charles B. Blair, Grand Rapids.
  - Hon. Chase S. Osborn, Sault Ste. Marie.

Minnesota:
- Governor John A. Johnson.
  - Hon. F. B. Lynch, St. Paul.
  - Dr Cyrus Northrop, Minneapolis.

Mississippi:
- Governor Edmond F. Noel.
  - Dr J. D. Barkdull, Natchez.
  - Judge D. M. Miller, Hazlehurst.
  - Mr A. M. Pepper, Lexington.

Missouri:
- Governor Joseph W. Folk.
  - Dr William H. Black, Marshall.
  - Mr N. W. McLeod, St. Louis.
  - Colonel John A. Ockerson, St. Louis.

Montana:
- Governor Edwin Norris.
  - Mr Paul A. Fusz, Philipsburg.
  - Mr W. B. George, Billings.
  - Mr Henry M. Rae, Giltedge.

Nebraska:
- Governor G. L. Sheldon.
  - Professor Erwin H. Barbour, Lincoln.
  - Professor E. A. Burnett, Lincoln.
  - Mr Victor Rosewater, Omaha.

Nevada:
- Governor John Sparks (absent).
  - Mr B. F. Leete, Reno.

New Hampshire:
- Governor Charles M. Floyd.
  - Mr Philip W. Ayres, Concord.
  - Hon. Irving W. Drew, Lancaster.
  - General Charles J. Hamblett, Nashua.

New Jersey:
- Governor John F. Fort.
  - Mr Harry R. Humphreys, Camden.
  - Dr Henry B. Kümmel, Trenton.
  - Mr Charles L. Pack, Lakewood.

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- Governor George Curry.
  - Mr George Arnot, Albuquerque.
  - Mr Will C. Barnes, Las Vegas.
  - Mr Ralph E. Twitchell, Albuquerque.

New York:
- Governor Charles E. Hughes.
  - Dr Nicholas Murray Butler, New York City.
  - Dr Jacob Gould Schurman, Ithaca.
  - Hon. James S. Whipple, Salamanca.

North Carolina:
- Governor Robert B. Glenn.
  - Judge Armistead Burwell, Charlotte.
  - Hon. Alfred D. Ward, Newbern.
  - Mr W. B. Cooper, Wilmington.

North Dakota:
- Governor John Burke (Honorary Secretary).
  - Hon. J. L. Cashel, Grafton.
  - Dr L. S. Platou, Valley City.
  - Hon. F. L. Thompson, Cando.

Ohio:
- Governor A. L. Harris.
  - Mr Allen Ripley Foote, Columbus.
  - Major George B. Fox, Rockland.
  - Mr D. J. Sinclair, Steubenville.

Oklahoma:
- Governor C. N. Haskell (absent).
  - Mr George W. Barnes, Muskogee.
  - Mr Scott Ferris.
  - Mr John F. McMurray.

Oregon:
- Governor George E. Chamberlain (absent).
  - Chief Justice Robert Sharpe Bean, Salem.
  - Mr C. S. Jackson, Portland.

Pennsylvania:
- Governor Edwin S. Stuart.
  - Mr Alba B. Johnson, Philadelphia.
  - Hon. Robert S. Murphy, Johnstown.
  - Colonel C. A. Rook, Pittsburg.

Porto Rico (Dependency of):
- Governor Regis H. Post.
  - Hon. Tulio Larrinaga (Resident Commissioner), Washington.
  - Hon. George W. Davis, Washington.
  - Hon. Beekman Winthrop, Washington.

Rhode Island:
- Governor James H. Higgins.
  - Mr E. G. Buckland, Providence.
  - Dr William H. P. Faunce, Providence.
  - Mr William J. Feeley, Providence.

South Carolina:
- Governor Martin F. Ansel.
  - Colonel J. C. Hemphill, Charleston.
  - Professor A. C. Moore, Columbia.
  - Mr J. E. Sirrine, Greenville.

South Dakota:
- Governor Coe I. Crawford.
  - Hon. T. S. Everitt, Redfield.
  - Hon. R. O. Richards, Huron.
  - Hon. Bartlett Tripp, Yankton.

Tennessee:
- Governor Malcolm R. Patterson (absent).
  - Chancellor John Allison, Nashville.
  - Mr J. H. Baird, Memphis.
  - Mr Frank S. Washburn, Winchester.

Texas:
- Governor T. M. Campbell (absent).
- Lieutenant-Governor A. B. Davidson.
  - Hon. B. M. Baker, Canadian.
  - Hon. Richard F. Burges, El Paso.
  - Hon. W. Goodrich Jones, Temple.

Utah:
- Governor John C. Cutler.
  - Mr James H. Mays, Salt Lake City.
  - Mr William W. Riter, Salt Lake City.
  - Mr Frank B. Stephens, Salt Lake City.

Vermont:
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    Hon. Willis N. Cady, Middlebury.
    Hon. Joseph A. De Boer, Montpelier.
    Hon. John L. Southwick, Burlington.
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    Dr E. A. Alderman, Charlottesville.
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    Hon. James B. Russell, Winchester.
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  Governor A. E. Mead.
    Mr Frank H. Lamb, Hoquiam.
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    Professor O. L. Waller, Pullman.
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    Mr Hu Maxwell, Morgantown.
    Mr James W. Paul, Charleston.
    Dr I. C. White, Morgantown (Speaker).
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    Hon. George A. Whiting, Neenah.
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  Governor Bryant B. Brooks.
    Hon. C. W. Burdick, Cheyenne.
    Hon. Edward Gillette, Sheridan.
    Mr George Metcalf, Douglas.

SPECIAL GUESTS

Hon. William Jennings Bryan.
Mr Andrew Carnegie.
Mr James J. Hill.
Mr John Mitchell.

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American Academy of Political and Social Science:
  President L. S. Rowe, Philadelphia.
American Association for the Advancement of Science:
  President T. C. Chamberlin, Chicago (Speaker).
American Association of Agricultural Colleges and Experiment Stations:
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American Chemical Society:
    President Marston T. Bogert, New York City.
American Civic Association:
    President J. Horace McFarland, Harrisburg.
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    President Simon N. Patten, Philadelphia.
American Electro-Chemical Society:
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    President Charles B. Dudley, Altoona.
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Brotherhood of Locomotive Firemen and Engineers,
Brotherhood of Railroad Trainmen:
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  President William Livingstone, Detroit.
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  President W. K. Kavanaugh, St. Louis.
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Missouri Valley River Improvement Association:
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  Powell Evans (Delegate), Philadelphia.

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Austin A. Burnham (General Secretary), Chicago.
National Civic Federation:
President Seth Low, New York.
National Council of Commerce:
President Gustav H. Schwab, New York City.
National Drainage Association:
George E. Barstow (ex-President), Barstow, Texas.
National Electric Light Association:
President Dudley Farrand, Newark, New Jersey.
National Farmers' Institute:
E. W. Wickey (Secretary), East Chicago, Indiana.
National Geographic Society:
President Willis L. Moore, Washington.
National Grange:
President N. J. Bachelder, Concord, New Hampshire.
National Hay Association:
President Charles J. Austin, New York.
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President Frank C. Goudy, Denver.
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President William Irvine, Chippewa Falls, Wisconsin.
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Niagara Falls Commission:
F. D. Millet (Member), New York City.
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President John L. Vance, Cincinnati.
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President Charles S. Howe, Cleveland.
Society of American Foresters:
Overton W. Price (Vice-President), Washington.
Upper Mississippi River Improvement Association:
President Thomas Wilkinson, Burlington, Iowa.

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American Industries:
H. H. Lewis, New York City.

American Magazine:
C. H. Forbes-Lindsay, New York City.

Century Magazine (The):
Richard Underwood Johnson, New York City.

Colliers Weekly:
Samuel E. Moffett, New York City.

Conservation (formerly Forestry and Irrigation):
Frank G. Heaton, Washington.

Electrical World:
T. C. Martin, New York City.

Engineering and Mining Journal:
Walter R. Ingalls, New York City.

Engineering News:
Charles Whiting Baker, New York City.

Everybodys Magazine:
John O'Hara Cosgrave, New York City.

Farm and Fireside:
John C. Barnett, Springfield, Ohio.

Farm Journal (The):
Wilmer Atkinson, Philadelphia.

Independent (The):
John Martin, New York City.

Iron Age:
Charles Kirchhoff, New York City.

Outlook (The):
Elbert F. Baldwin, New York City.

Proceedings American Institute of Electrical Engineers:
Ralph W. Pope, New York City.

Proceedings American Institute of Mining Engineers:
Joseph Struthers, New York City.

Proceedings American Society of Civil Engineers:
Charles Warren Hunt, New York City.

Proceedings American Society of Mechanical Engineers:
Calvin W. Rice, New York City.

Review of Reviews (The):
Albert Shaw, New York City.

Success:
Orison Swett Marden, New York City.

Worlds Work:
Walter H. Page, New York City.

GENERAL GUESTS

Hon. O. P. Austin, Chief Bureau of Statistics, Department of Commerce and Labor.
Professor Liberty Hyde Bailey, Ithaca, New York.
Mr C. J. Blanchard, Statistician U. S. Reclamation Service.
Hon. George M. Bowers, Commissioner of Fisheries.
Ex-Senator Joseph M. Carey, Cheyenne, Wyoming.
Mr W. B. Cooper, Alternate Advisor from North Carolina.
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General O. H. Ernst, Chairman International Waterways Commission.
Mr John A. Fox, Blytheville, Arkansas.
Mr Charles Frederick, Alternate Advisor from Ohio.
Mr Henry Gannett, Chairman U. S. Geographic Board.
Mr E. O. Garrett, Alternate Advisor from Nebraska.
Reverend Edward Everett Hale, Chaplain U. S. Senate.
Dr J. A. Holmes, Chief Technologic Branch U. S. Geological Survey.
Dr L. O. Howard, Chief of the Bureau of Entomology.
Professor Emory R. Johnson (Speaker), University of Pennsylvania, Philadelphia.
Hon. Martin A. Knapp, Chairman Interstate Commerce Commission.
Dr George M. Kober (Speaker), Washington.
Mr M. O. Leighton, Chief Water Resources Branch U. S. Geological Survey.
Hon. Francis E. Leupp, Commissioner of Indian Affairs.
Mr R. A. Long (Speaker), Kansas City.
Mr John L. Mathews, Boston.
Dr Alonzo D. Melvin, Chief of the Bureau of Animal Industry.
Dr C. Hart Merriam, Chief of the Biological Survey.
Mr Alex. McNeil, Representative of Canadian papers.
Mr S. M. Neely, Alternate Advisor from Tennessee.
Hon. Charles P. Neill, Commissioner of Labor.
Hon. S. N. D. North, Director of the Census.
Mr Victor H. Olmstead, Chief Bureau of Statistics, Department of Agriculture.
Hon. George C. Pardee (Speaker), Oakland, California.
Mr Amos R. E. Pinchot, New York City.
Mr F. G. Plummer, Geographer Forest Service.
Dr Joseph Hyde Pratt, State Geologist of North Carolina.
Dr Henry S. Pritchett, Director Carnegie Foundation, New York City.
Hon. Robert P. Porter, Foreign press representative, New York City.
Mr H. St. Clair Putnam (Speaker), New York City.
Mr Calvin W. Rice, Secretary American Society of Mechanical Engineers, New York City.

Dr George Otis Smith, Director of the U. S. Geological Survey.

Hon. J. Knox Taylor, Architect of the Treasury.

Mr Percy Thompson, Alternate Advisor from New Jersey.

Dr Otto H. Tittman, Superintendent of the U. S. Coast and Geodetic Survey.

Dr A. C. True, Director of the Office of Experiment Stations, Department of Agriculture.

Dr Charles D. Walcott, Secretary of the Smithsonian Institution.

Mr J. S. Warren, Alternate Advisor from Tennessee.

Dr Harvey W. Wiley, Chief of the Bureau of Chemistry, Department of Agriculture.

Professor Milton Whitney, Chief of the Bureau of Soils, Department of Agriculture.

Dr Robert S. Woodward, President Carnegie Institution, Washington.

INLAND WATERWAYS COMMISSION

Theodore E. Burton (Chairman), House of Representatives.

Francis G. Newlands (Vice-Chairman), U. S. Senate.

W J McGee (Secretary), Erosion Expert, Bureau of Soils; member of Conference Committee, and Recording Secretary of the Conference.

William Warner, U. S. Senate.

John H. Bankhead, U. S. Senate.

Alexander Mackenzie, Chief of Engineers, U. S. Army, War Department.

F. H. Newell, Director U. S. Reclamation Service; member Conference Committee.

Gifford Pinchot, U. S. Forester; Chief of the Forest Service; Chairman Conference Committee.

Herbert Knox Smith, Commissioner in charge of the Bureau of Corporations.

Thomas R. Shipp, General Secretary of the Conference.

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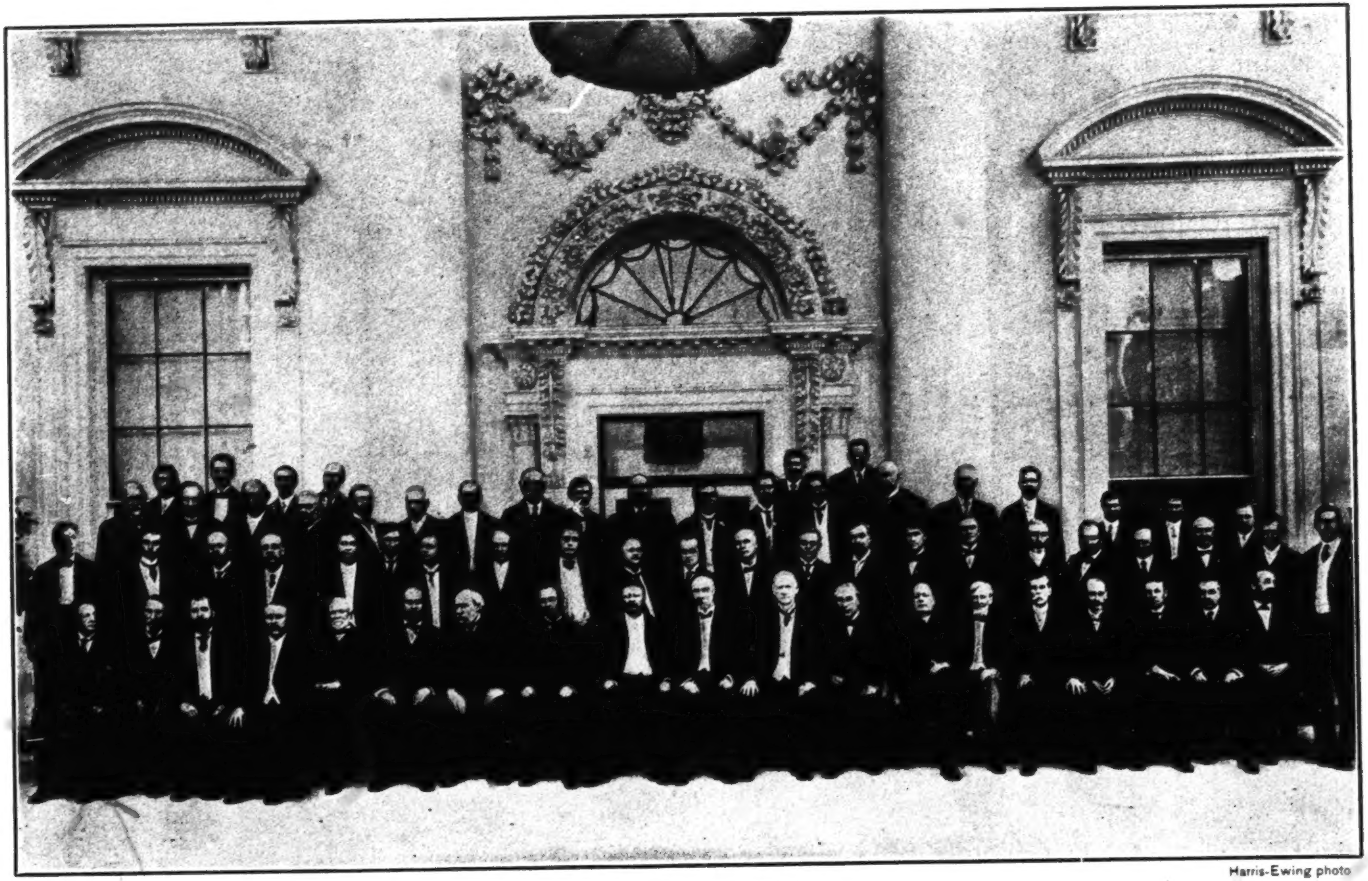

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GOVERNORS IN ATTENDANCE

GOVERNORS IN ATTENDANCE

STANDING; REARWARD

General Mackenzie, Mr Shipp, Mr Burton, Mr Pinchot, Senator Bankhead, Mr Herbert Knox Smith, Dr McGee, Mr Newell, Governor Kibbey, Governor Ansel, Governor Cutler, Governor Lea, Governor Dawson, Governor Floyd, Governor Willson, Governor Swanson, Governor Curry, Governor Crawford, Governor Johnson, Governor Stuart, Ex-Governor Hill, Governor Frear (with Mr Parker, Mr Stone, and Mr Hackett of the White House Staff).

STANDING; FORWARD

Mr Plummer, Governor Post, Governor Proctor, Governor Fort, Governor Blanchard, Governor Burke, Governor Folk, Governor Norris, Governor Hoch, Governor Woodruff, Governor Higgins, Governor Glenn, Governor Deneen, Governor Warner, Governor Hanly, Governor Comer, Governor Brooks, Governor Buchtel, Governor Gooding, Governor Noel, Governor Hoggatt, Secretary Garfield.

SEATED

Senator Newlands, Governor Harris, Governor Hughes, Governor Davidson, Mr Carnegie, Mr Bryan, Mr Hill, Mr Mitchell, President Roosevelt, Vice-President Fairbanks, Mr Justice Harlan, Mr Justice Brewer, Mr Justice White, Mr Justice McKenna, Mr Justice Holmes, Mr Justice Day, Mr Justice Moody, Secretary Cortelyou, Secretary Bonaparte.

CONFERENCE OF GOVERNORS

MAY 13-15, 1908

VERBATIM RECORD

OPENING SESSION

The opening session of the Conference of Governors, assembled in the East Room of the White House, was called to order at 11 oclock, a. m., May 13, 1908, by the President of the United States.

Dr **EDWARD EVERETT HALE**, Chaplain of the United States Senate, being called on, invoked the benediction in these words:

"*The Lord thy God bringeth thee into a good land, a land of brooks of water, of fountains and springs, flowing forth in valleys and hills, a land of wheat and barley and vines and fig trees and pomegranates, a land of olive trees and honey, a land wherein thou shalt eat bread without scarceness. Thou shalt not lack anything in it—a land where stones are iron and out of whose hills thou mayest dig copper.*

"*Beware lest when thou hast eaten and art full, thou forget the Lord thy God.*

"*Thine eyes shall behold a land that reacheth afar, a place of broad rivers and streams. Yea, thy children shall possess the nations and make the desolate spots to be inhabited.*

"*So they helped everyone his neighbor and every one said to his brother, 'Be of good courage.' So the carpenter encouraged the goldsmith and he that smoteth with the hammer him that smote the anvil.*

"*'Bear ye one another's burdens,' and so fulfill the law of Christ.*"

Let us pray.

Father, for this we have come together. Thou hast made for us the Paradise through which these rivers flow. Now give us the strength of Thy Holy Spirit that we may go into this garden of Thine and bring forth fruit in Thy service. Thou hast revealed these to us to use under Thy guidance. We are children of the living God, alive with Thy life, inspirited with Thy Holy Spirit. The harvest field is ready and thou are pleased to send us into the harvest. Be with us now in our assemblage. Thy servants have come from the north and from the south, from the east and from the west. It is our God's land. Thy oceans send their mists into our mountains;

Thy streams descend into our valleys; and Thou hast chosen us that we may be now the ministers of Thy will and enter into that harvest field.

Bless us now in to-day's service and those that are to follow, and may Thy servants return to their homes, alive in that light, clad in the Holy Spirit, willing to enter into Thy work and to go about our Father's business.

Join me audibly in the Lord's Prayer.

Our Father which art in Heaven, hallowed be Thy name, Thy Kingdom come, Thy will be done on earth as it is in Heaven. Give us this day our daily bread and forgive us our trespasses as we forgive those who trespass against us. Lead us not into temptation, but deliver us from evil, for Thine is the kingdom and the power and the glory, forever. Amen.

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OPENING ADDRESS BY THE PRESIDENT

Governors of the several States; and Gentlemen:

I welcome you to this Conference at the White House. You have come hither at my request, so that we may join together to consider the question of the conservation and use of the great fundamental sources of wealth of this Nation.

So vital is this question, that for the first time in our history the chief executive officers of the States separately, and of the States together forming the Nation, have met to consider it. It is the chief material question that confronts us, second only—and second always—to the great fundamental questions of morality. [Applause]

With the governors come men from each State chosen for their special acquaintance with the terms of the problem that is before us. Among them are experts in natural resources and representatives of national organizations concerned in the development and use of these resources; the Senators and Representatives in Congress; the Supreme Court, the Cabinet, and the Inland Waterways Commission have likewise been invited to the Conference, which is therefore national in a peculiar sense.

This Conference on the conservation of natural resources is in effect a meeting of the representatives of all the people of the United States called to consider the weightiest problem now before the Nation; and the occasion for the meeting lies in the fact that the natural resources of our country are in danger of exhaustion if we permit the old wasteful methods of exploiting them longer to continue.

With the rise of peoples from savagery to civilization, and with the consequent growth in the extent and variety of the needs of the average man, there comes a steadily increasing growth of the amount demanded by this average man from the actual resources of the country. And yet, rather curiously, at the same time that there comes that increase in what the average man demands from the resources, he is apt to grow to lose the sense of his dependence upon nature. He lives in big cities. He deals in industries that do not bring him in close touch with nature. He does not realize the demands he is making upon nature. For instance, he finds, as he has found before in many parts of this country, that it is cheaper to build his house of concrete than of wood, learning in this way only that he has allowed the woods to become exhausted. That is happening, as you know, in parts of this country at this very time.

Savages, and very primitive peoples generally, concern themselves only with superficial natural resources; with those which they obtain from the actual surface of the ground. As peoples become a little less primitive, their industries, although in a rude manner, are extended to resources below the surface; then, with what we call civilization and the extension of knowledge, more resources come into use, industries are multiplied, and foresight begins to become a necessary and prominent factor in life. Crops are cultivated; animals are domesticated; and metals are mastered.

We can not do any of these things without foresight, and we can not, when the nation becomes fully civilized and very rich, continue to be civilized and rich unless the nation shows more foresight than we are showing at this moment as a nation. [Applause]

Every step of the progress of mankind is marked by the discovery and use of natural resources previously unused. Without such progressive knowledge and utilization of natural resources population could not grow, nor industries multiply, nor the hidden wealth of the earth be developed for the benefit of mankind.

From the first beginnings of civilization, on the banks of the Nile and the Euphrates, the industrial progress of the world has gone on slowly, with occasional set-backs, but on the whole steadily, through tens of centuries to the present day.

It never does advance by jumps, gentlemen. It always goes slowly. There are occasional set-backs, but on the whole it goes steadily.

But of late the rapidity of the process has increased at such a rate that more space has been actually covered during the century and a quarter occupied by our national life than during the preceding six thousand years that take us back to the earliest monuments of Egypt, to the earliest cities of the Babylonian plain.

Now, I ask you to think what that means; and I am speaking with historic literalness. In the development, the use, and therefore the exhaustion of certain of the natural resources, the progress has been more rapid in the past century and a quarter than during all preceding time of which we have record.

When the founders of this nation met at Independence Hall in Philadelphia the conditions of commerce had not fundamentally changed from what they were when the Phoenician keels first furrowed the lonely waters of the Mediterranean.

You turn to Homer—some of you did in your school days, even if you do not now [laughter]—and you will see that he spoke, not of the Mediterranean but of one corner of the Egean only, as a limitless waste of water which no one had traversed. There is now no nook of the earth that we are not searching.

When our forefathers met in Independence Hall, the differences were those of degrees, not of kind, and they were not in all cases even those of degree. Mining was carried on fundamentally as it had been carried on by the Pharaohs in the countries adjacent to the Red Sea. Explorers now-a-days by the shores of the Red Sea strike countries that they call new, but they find in them mines, with sculptures of the Pharaohs, showing that those mines were worked out and exhausted thousands of years before the Christian era.

In 1776 the wares of the merchants of Boston, of Charleston, like the wares of the merchants of Nineveh and Sidon, if they went by water, were carried by boats propelled by sails or oars; if they went by land were carried in wagons drawn by beasts of draft or in packs on the backs of beasts of burden. The ships that crossed the high seas were better than the ships that three thousand years before crossed the Egean, but they were of the same type, after all—they were wooden ships propelled by sails. There the difference was one of degree in our favor. On shore the difference was one of degree against us, for on land the roads, at the end of the eighteenth century, when this country became a nation, were not as good as the roads of the Roman Empire, while the service of the posts, at any rate prior to the days of Benjamin Franklin, was probably inferior. In the previous eighteen hundred years there had been a retrogression in roads and in postal service.

In Washington's time anthracite coal was known only as a useless black stone; and the great fields of bituminous coal were undiscovered. As steam was unknown, the use of coal for power production was undreamed of. Water was practically the only source of power, save the labor of men and animals; and this power was used only in the most primitive fashion. But a few small iron deposits had been found in this country, and the use of iron by our countrymen was very small. Wood was practically the only fuel, and what lumber was sawed was consumed locally, while the forests were regarded chiefly as obstructions to settlement and cultivation. The man who cut down a tree was held to have conferred a service upon his fellows.

Such was the degree of progress to which civilized mankind had attained when this nation began its career. It is almost impossible for us in this day to realize how little our Revolutionary ancestors knew of the great store of natural resources whose discovery and use have been such vital factors in the growth and greatness of this Nation, and how little they required to take from this store in order to satisfy their needs.

Since then our knowledge and use of the resources of the present territory of the United States have increased a hundred-fold. Indeed, the growth of this Nation by leaps and bounds makes one of the most striking and important chapters in the history of the world. Its growth has been due to the rapid development, and alas that it should be said!

to the rapid destruction, of our natural resources. Nature has supplied to us in the United States, and still supplies to us, more kinds of resources in a more lavish degree than has ever been the case at any other time or with any other people. Our position in the world has been attained by the extent and thoroughness of the control we have achieved over nature; but we are more, and not less, dependent upon what she furnishes than at any previous time of history since the days of primitive man.

Yet our fathers, though they knew so little of the resources of the country, exercised a wise forethought in reference thereto. Washington clearly saw that the perpetuity of the States could only be secured by union, and that the only feasible basis of union was an economic one; in other words, that it must be based on the development and use of their natural resources. Accordingly, he helped to outline a scheme of commercial development, and by his influence an interstate waterways commission was appointed by Virginia and Maryland.

It met near where we are now meeting, in Alexandria, adjourned to Mount Vernon, and took up the consideration of interstate commerce by the only means then available, that of water; and the trouble we have since had with the railways has been mainly due to the fact that naturally our forefathers could not divine that the iron road would become the interstate and international highway, instead of the old route by water. Further conferences were arranged, first at Annapolis, and then at Philadelphia. It was in Philadelphia that the representatives of all the States met for what was in its original conception merely a waterways conference; but when they had closed their deliberations the outcome was the Constitution which made the States into a Nation. [Applause]

The Constitution of the United States thus grew in large part out of the necessity for united action in the wise use of one of our natural resources. The wise use of all of our natural resources, which are our national resources as well, is the great material question of today. I have asked you to come together now because the enormous consumption of these resources, and the threat of imminent exhaustion of some of them, due to reckless and wasteful use, once more calls for common effort, common action.

We want to take action that will prevent the advent of a woodless age, and defer as long as possible the advent of an ironless age. [Applause]

Since the days when the Constitution was adopted, steam and electricity have revolutionized the industrial world. Nowhere has the revolution been so great as in our own country. The discovery and utilization of mineral fuels and alloys have given us the lead over all other nations in the production of steel. The discovery and utilization of coal and iron have given us our railways, and have led to such industrial development as has never before been seen. The vast wealth of lumber in our forests, the riches of our soils and mines, the discovery of gold and mineral oils, combined with the efficiency of our transportation, have made the conditions of our life unparalleled in comfort and convenience.

A great many of these things are truisms. Much of what I say is so familiar to us that it seems commonplace to repeat it; but familiar though it is, I do not think as a nation we understand what its real bearing is. It is so familiar that we disregard it. [Applause]

The steadily increasing drain on these natural resources has promoted to an extraordinary degree the complexity of our industrial and social life. Moreover, this unexampled development has had a determining effect upon the character and opinions of our people. The demand for efficiency in the great task has given us vigor, effectiveness, decision, and power, and a capacity for achievement which in its own lines has never yet been matched. [Applause] So great and so rapid has been our material growth that there has been a tendency to lag behind in spiritual and moral growth [laughter and applause]; but that is not the subject upon which I speak to you today.

Disregarding for the moment the question of moral purpose, it is safe to say that the prosperity of our people depends directly on the energy and intelligence with which our natural resources are used. It is equally clear that these resources are the final basis of national power and perpetuity. Finally, it is ominously evident that these resources are in the course of rapid exhaustion.

This Nation began with the belief that its landed possessions were illimitable and capable of supporting all the people who might care to make our country their home; but already the limit of unsettled land is in sight, and indeed but little land fitted for agriculture now remains unoccupied save what can be reclaimed by irrigation and drainage—a subject with which this Conference is partly to deal. We began with an unapproached heritage of forests; more than half of the timber is gone. We began with coal fields more extensive than those of any other nation and with iron ores regarded as inexhaustible, and many experts now declare that the end of both iron and coal is in sight.

The mere increase in our consumption of coal during 1907 over 1906 exceeded the total consumption in 1876, the Centennial year. This is a striking fact: Thirty years went by, and the mere surplus of use of one year over the preceding year exceeded all that was used in 1876—and we thought we were pretty busy people even then. The enormous stores of mineral oil and gas are largely gone; and those Governors who have in their States cities built up by natural gas, where the natural gas has since been exhausted, can tell us something of what that means. Our natural waterways are not gone, but they have been so injured by neglect, and by the division of responsibility and utter lack of system in dealing with them, that there is less navigation on them now than there was fifty years ago. Finally, we began with soils of unexampled fertility, and we have so impoverished them by injudicious use and by failing to check erosion that their crop-producing power is diminishing instead of increasing. In a word, we have thoughtlessly, and to a large degree unnecessarily, diminished the resources upon which not only our prosperity but the prosperity of our children and our children's children must always depend.

We have become great in a material sense because of the lavish use of our resources, and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soils shall have been still further impoverished and washed into the streams, polluting the rivers, denuding the fields, and obstructing navigation. These questions do not relate only to the next century or to the next generation. One distinguishing characteristic of really civilized men is foresight; we have to, as a nation, exercise foresight for this nation in the future; and if we do not exercise that foresight, dark will be the future! [Applause] We should exercise foresight now, as the ordinarily prudent man exercises foresight in conserving and wisely using the property which contains the assurance of well-being for himself and his children. We want to see a man own his farm rather than rent it, because we want to see it an object to him to transfer it in better order to his children. We want to see him exercise forethought for the next generation. We need to exercise it in some fashion ourselves as a nation for the next generation.

The natural resources I have enumerated can be divided into two sharply distinguished classes accordingly as they are or are not capable of renewal. Mines if used must necessarily be exhausted. The minerals do not and can not renew themselves. Therefore in dealing with the coal, the oil, the gas, the iron, the metals generally, all that we can do is to try to see that they are wisely used. The exhaustion is certain to come in time. We can trust that it will be deferred long enough to enable the extraordinarily inventive genius of our people to devise means and methods for more or less adequately replacing what is lost; but the exhaustion is sure to come.

The second class of resources consists of those which can not only be used in such manner as to leave them undiminished for our children, but can actually be improved by wise use. The soil, the forests, the waterways come in this category. Every one knows that a really good farmer leaves his farm more valuable at the end of his life than it was when he first took hold of it. So with the waterways. So with the forests. In dealing with mineral resources, man is able to improve on nature only by putting the resources to a beneficial use which in the end exhausts them; but in dealing with the soil and its products man can improve on nature by compelling the resources to renew and even reconstruct themselves in such manner as to serve increasingly beneficial uses—while the living waters can be so controlled as to multiply their benefits.

Neither the primitive man nor the pioneer was aware of any duty to posterity in dealing with the renewable resources. When the American settler felled the forests, he felt that there was plenty of forest left for the sons who came after him. When he exhausted the soil of his farm, he felt that his son could go West and take up another. The Kentuckian or the Ohioan felled the forest and expected his son to move west and fell other forests on the banks of the Mississippi; the Georgian exhausted his farm and moved into Alabama or to the mouth of the Yazoo to take another. So it was with his immediate successors. When the soil-wash from the farmer's field choked the neighboring river, the only thought was to use the railway rather than the boats to move produce and supplies. That was so up to the generation that preceded ours.

Now all this is changed. On the average the son of the farmer of today must make his living on his father's farm. There is no difficulty in doing this if the father will exercise wisdom. No wise use of a farm exhausts its fertility. So with the forests. We are over the verge of a timber famine in this country, and it is unpardonable for the Nation or the States to permit any further cutting of our timber save in accordance with a system which will provide that the next generation shall see the timber increased instead of diminished. [Applause]

Just let me interject one word as to a particular type of folly of which it ought not to be necessary to speak. We stop wasteful cutting of timber; that of course makes a slight shortage at the moment. To avoid that slight shortage at the moment, there are certain people so foolish that they will incur absolute shortage in the future, and they are willing to stop all attempts to conserve the forests, because of course by wastefully using them at the moment we can for a year or two provide against any lack of wood. That is like providing for the farmer's family to live sumptuously on the flesh of the milch cow. [Laughter.] Any farmer can live pretty well for a year if he is content not to live at all the year after. [Laughter and applause]

We can, moreover, add enormous tracts of the most valuable possible agricultural land to the national domain by irrigation in the arid and semi-arid regions, and by drainage of great tracts of swamp land in the humid regions. We can enormously increase our transportation facilities by the canalization of our rivers so as to complete a great system of waterways on the Pacific, Atlantic, and Gulf coasts and in the Mississippi Valley, from the Great Plains to the Alleghenies, and from the northern lakes to the mouth of the mighty Father of Waters. But all these various uses of our natural resources are so closely connected that they should be coordinated, and should be treated as part of one coherent plan and not in haphazard and piecemeal fashion.

It is largely because of this that I appointed the Waterways Commission last year, and that I sought to perpetuate its work. There are members of the coordinate branch present. The reason this meeting takes place is because we had that waterways commission last year. I had to prosecute the work by myself. I have asked Congress to pass a bill giving some small sum of money for the perpetuation of that Commission. If Congress does not act, I will perpetuate the Commission anyway, [Great applause] but of course it is a great deal better that Congress should act; [Applause] it enables the work to be more effectively done. I hope there will be action. But the Commission will go ahead.

I wish to take this opportunity to express in heartiest fashion my acknowledgment to all the members of the Commission. At great personal sacrifice of time and effort they have rendered a service to the public for which we can not be too grateful. Especial credit is due to the initiative, the energy, the devotion to duty, and the farsightedness of Gifford Pinchot, [Great applause] to whom we owe so much of the progress we have already made in handling this matter of the coordination and conservation of natural resources. If it had not been for him this convention neither would nor could have been called.

We are coming to recognize as never before the right of the Nation to guard its own future in the essential matter of natural resources. In the past we have admitted the right of the individual to injure the future of the Republic for his own present profit. In fact there has been a good deal of a demand for unrestricted individualism, for the right of the individual to injure the future of all of us for his own temporary and immediate profit. The time has come for a change. As a people we have the right and the duty, second to none other but the right and duty of obeying the moral law, of requiring and doing justice, to protect ourselves and our children against the wasteful development of our natural resources, whether that waste is caused by the actual destruction of such resources or by making them impossible of development hereafter.

Any right thinking father earnestly desires and strives to leave his son both an untarnished name and a reasonable equipment for the struggle of life. So this Nation as a whole should earnestly desire and strive to leave to the next generation the national honor unstained and the national resources unexhausted. There are signs that both the Nation and the States are waking to a realization of this great truth. On March 10, 1908, the Supreme Court of Maine rendered an exceedingly important judicial decision. This opinion was rendered in response to questions as to the right of the Legislature to restrict the cutting of trees on private land for the prevention of droughts and floods, the preservation of the natural water supply, and the prevention of the erosion of such lands, and the consequent filling up of rivers, ponds, and lakes. The forests and water power of Maine constitute the larger part of her wealth and form the basis of her industrial life, and the question submitted by the Maine Senate to the Supreme Court and the answer of the Supreme Court alike bear testimony to the wisdom of the people of Maine, and clearly define a policy of conservation of natural resources, the adoption of which is of vital importance not merely to Maine but to the whole country. [Applause]

Such a policy will preserve soil, forests, water power as a heritage for the children and the children's children of the men and women of this generation; for any enactment that provides for the wise utilization of the forests, whether in public or private ownership, and for the conservation of the water resources of the country, must necessarily be legislation that will promote both private and public welfare; for flood prevention, water-power development, preservation of the soil, and improvement of navigable rivers are all promoted by such a policy of forest conservation.

The opinion of the Maine Supreme Bench sets forth unequivocally the principle that the property rights of the individual are subordinate to the rights of the community, and especially that the waste of wild timber land derived originally from the State, involving as it would the impoverishment of the State and its People and thereby defeating a great purpose of government, may properly be prevented by State restrictions.

The Court says that there are two reasons why the right of the public to control and limit the use of private property is peculiarly applicable to property in land:

> First, such property is not the result of productive labor, but is derived solely from the State itself, the original owner; second, the amount of land being incapable of increase, if the owners of large tracts can waste them at will without State restriction, the State and its people may be helplessly impoverished and one great purpose of government defeated. * * * We do not think the proposed legislation would operate to "take" private property within the inhibition of the Constitution. While it might restrict the owner of wild and uncultivated lands in his use of them, might delay his taking some of the product, might delay his anticipated profits and even thereby might cause him some loss of profit, it would nevertheless leave him his lands, their product and increase, untouched, and without diminution of title, estate, or quantity. He would still have large measure of control and large opportunity to realize values. He might suffer delay but not deprivation. * * * The proposed legislation * * * would be within the legislative power and would not operate as a taking of private property for which compensation must be made.

The Court of Errors and Appeals of New Jersey has adopted a similar view, which has recently been sustained by the Supreme Court of the United States. In delivering the opinion of the Court on April 6, 1908, Mr. Justice Holmes said:

> The State as quasi sovereign and representative of the interests of the public has a standing in court to protect the atmosphere, the water, and the forests within its territory, irrespective of the assent or dissent of the private owners of the land most immediately concerned. * * * It appears to us that few public interests are more obvious, indisputable and independent of particular theory than the interest of the public of a State to maintain the rivers that are wholly within it substantially undiminished, except by such drafts upon them as the guardian of the public welfare may permit for the purpose of turning them to a more perfect use.

[Applause]

> This public interest is omnipresent wherever there is a State, and grows more pressing as population grows.

Not as a dictum of law, which I cannot make, but as a dictum of morals, I wish to say that this applies to more than the forests and streams. [Laughter and applause] The learned Justice proceeds:

> We are of opinion, further, that the constitutional power of the State to insist that its natural advantages shall remain unimpaired by its citizens is not dependent upon any nice estimate of the extent of present use or speculation as to future needs. The legal conception of the necessary is apt to be confined to somewhat rudimentary wants, and there are benefits from a great river that might escape a lawyer's view.

[Laughter] I have simply quoted. [Laughter]

> But the State is not required to submit even to an esthetic analysis. Any analysis may be inadequate. It finds itself in possession of what all admit to be a great public good, and what it has it may keep and give no one a reason for its will.

These decisions reach the root of the idea of conservation of our resources in the interests of our people.

Finally, let us remember that the conservation of our natural resources, though the gravest problem of today, is yet but part of another and greater problem to which this Nation is not yet awake, but to which it will awake in time, and with which it must hereafter grapple if it is to live—the problem of national efficiency, the patriotic duty of insuring the safety and continuance of the Nation. [Applause.] When the People of the United States consciously undertake to raise themselves as citizens, and the Nation and the States in their several spheres, to the highest pitch of excellence in private, State, and national life, and to do this because it is the first of all the duties of true patriotism, then and not till then the future of this Nation, in quality and in time, will be assured. [Great applause]

After the conclusion of the opening address (the President being in the chair), Captain McCoy, Aide to the President, requested the Conferees to pass through the main entrance in order that the President might have the pleasure of greeting them personally; also that the Vice-President, the Justices of the Supreme Court, the Cabinet, the Governors of the States and other dinner guests of the evening before, including the members of the Inland Waterways Commission, should pass into the Blue Drawing Room before leaving the building.

The **President**: Information concerning the arrangements for the Conference and the entertainment of members can be obtained from Dr W J McGee, the Secretary of the Inland Waterways Commission, or from Mr Thomas R. Shipp, the General Secretary of the Conference.

In view of the large number of topics to be considered and the need of several of the Governors to be home soon as possible, the special statements by experts should be limited to twenty minutes, and ex tempore discussion to ten minutes, unless it is extended by the Governors themselves. A bell will ring once three minutes before the end of the time, and twice when the time has expired.

The Proceedings of the Conference will be recorded, and published in full; but it might be desirable to summarize some of the results. I would be glad, if the Governors see fit, to provide for a Committee on Resolutions to formulate general conclusions, should that meet with your approval. If you see fit to appoint such a committee, I think it should be appointed at the opening of the Second (or afternoon) Session. I make the suggestion to you simply as a suggestion, so that you may have something to work on. For the same purpose, I suggest that Governors Blanchard, of Louisiana, Fort, of New Jersey, Cutler, of Utah, Davidson, of Wisconsin, and Ansel, of South Carolina, might be named as such a committee. Those names have been suggested to me by various governors and others present. I simply put them before you for your consideration; you can of course name any committee you may desire. Resolutions should be referred to the committee without discussion, the discussion to follow the committee's report upon them.

Governor **Johnson**: Mr President, following your suggestion, I would move, if it is proper at this time, that the committee suggested by yourself be made the Committee on Resolutions of this Conference.

The motion was seconded by several Governors.

The **President**: Gentlemen, you have heard the motion, which has been seconded. Is any other motion offered, or is debate desired?

On demand for the question a viva voce vote was taken, and the motion was agreed to without dissenting voice.

Governor **Noel**: I move that the second suggestion, that all resolutions shall be referred to this Committee without debate, be adopted.

The motion was seconded; and the question being demanded, the motion was put and was agreed to without dissent.

The **President**: Gentlemen, I shall now have the pleasure of meeting you personally as you pass through the Blue Room.

So the Conference rose at 12.05 p. m.

SECOND SESSION

The Conference was called to order by the President at 2:40 oclock p. m. (May 13).

The **PRESIDENT**: If Governor Johnson is to be here tomorrow morning, I should like to have him preside after I leave the Chair.

Governor **JOHNSON**: Thank you, sir. [Applause]

The **PRESIDENT**: The Conferees, I am sure, would like to hear anything that Mr Bryan might care to say on the subject before us. [Applause, during which Mr Bryan communicated directly with the President.]

Mr Bryan informs me he would prefer to wait until the close of the formal discussions, and that then he will address you.

Gentlemen, as you will, I am sure, understand, it is not in my power to remain present during the entire Conference. I have a good deal to do. I will open each session, and after the opening paper has been read, I will ask the Governor who is with me to preside over the conference. In this case, Governor Noel of Mississippi will occupy the Chair. [Applause]

The first Opening Statement will be on the conservation of ores and related minerals, by Mr Carnegie. [Applause]

THE CONSERVATION OF ORES AND RELATED MINERALS

ANDREW CARNEGIE

Mr President and Governors:

You have begun to make history today, for never before has the National Governor called all the State Governors into conference. The President has acted upon the axiom that while it is well to follow good precedents, it is better to make them. Washington in 1785 invited the Commissioners of Maryland and Virginia to Mount Vernon when they conferred at Alexandria upon the joint regulation of the Potomac. This was the first slight revelation of the important interstate problems which lie imbedded in our Federal system. It is no new question with which you have to deal. My province today is to ask your attention to the situation as affected by our mineral supplies, chiefly iron and coal.

But let me first state that for all the data, facts, and much else used in this address I am indebted to Government officials of the Geological

Survey and other scientific bureaus, the extent and variety of whose knowledge have much impressed me, although I have long known that our Government is celebrated for the range and thoroughness of its investigations and the amount of statistical information it has acquired and keeps up to date regarding the nation and people. I have heard more than one prominent public man of other lands express admiration for our governmental reports. [Applause]

Of all the world's metals, iron is in our day the most useful. The opening of the Iron Age marked the beginning of real industrial development. The mining of copper and tin and the making of bronze implements closed the Stone Age in Europe and Asia, but it was not until the smelting of iron started in Africa and spread to Europe that industrial progress began; in all countries the highest civilization has followed the use of iron in the arts and crafts. Today the position of nations may almost be measured by its production and use.

Iron and coal form the foundation of our industrial prosperity. The value of each depends upon the amount and nearness of the other. In modern times the manufacturing and transportation industries rest upon them; and, given sufficient land area and fertile soil, these determine the progress of any people. When the United States entered upon its unexampled career the extent and value of our deposits of iron and coal were unknown. It was only through the growth of population, increase of knowledge, and invention, that they gained such value as to render their quantity an important public question.

Iron smelting began with charcoal made in neighboring forests. Electrical smelting by means of waterpower has only recently been tried. Today the reduction of our ores and the manufacture of iron practically rest upon the extent and availability of our coal.

When the Republic was founded, there were, according to recent expert estimates, approximately 2,000,000,000,000 tons of coal in the territory now forming the United States. Practically none of this supply was used for over a quarter-century; but during the 75 years from 1820 to 1895 nearly 4,000,000,000 tons were mined by methods so wasteful that some 6,000,000,000 tons were either destroyed or allowed to remain in the ground, forever inaccessible. During the 10 years from 1896 to 1906 as much was produced as during the preceding 75 years; while more than 3,000,000,000 tons were destroyed or left in the ground beyond reach of future use. To date the actual consumption of coal has been over 7,500,000,000 tons; the waste and destruction in the neighborhood of 9,000,000,000 tons. If mining were perfected from now forward, we might reckon that considerably less than 1% of our original stock has been consumed; but estimating on the basis of the wasteful methods hitherto pursued, nearly 2% of our available supply is gone.

Coal consumption is increasing at an astonishing rate. During the period for which statistics have been gathered, it has doubled in each decade; of late it has more than doubled. In 1907 the production was about 450,000,000 tons. At the present rate of increase the production in 1917 will be 900,000,000 tons, in 1927 1,800,000,000 tons, and in 1937 over 3,500,000,000 tons, or an amount in that year alone nearly equal to the production of the 75 years ending in 1895; and with continuation of the wasteful methods of mining, the consumption and destruction together during that one year would equal our total useful production up to the present date. And at that time—which many of us will live to see—more than an eighth of our estimated original supply will have been consumed or destroyed.

All estimates of future consumption and destruction of coal are liable to error; yet making all reasonable allowance, unless there be careful husbanding, or revolutionizing inventions, or some industrial revolution comes which can not now be foreseen, the greater part of that estimated 2,500,000,000,000 tons of coal forming our original heritage will be gone before the end of the next century, say two hundred years hence.

To each generation the ultimate disappearance of coal is of less concern than current prices. With the working out of seams and fields, plants and transportation facilities are removed or abandoned, and other losses are incurred; and the cost of these in the end increases prices. Already this is felt; it is estimated that by reason of the progressive exhaustion of American fields, coal consumers are today paying on an average 10% or 15% more than would be necessary if the supply were unlimited—and the advance must continue with each decade as the supply lessens.

Still more wasteful than our processes of mining are our methods of consuming coal. Of all the coal burned in the power-plants of the country, not more than from 5% to 10% of the potential energy is actually used; the remaining 90% to 95% is absorbed in rendering the smaller fraction available in actual work. In direct heating the loss is less, but in electric heating and lighting it is much more; indeed, in ordinary electric-light plants hardly one-fifth of one per cent—one five-hundredth part—of the energy of the coal is actually utilized. There is at present no known remedy for this. These wastes are not increasing; fortunately, through the development of gas-producers, internal-combustion engines, and steam turbines they are constantly decreasing; yet not so rapidly as to affect seriously the estimates of increase in coal consumption. We are not without hope, however, of discoveries that may yet enable man to convert potential into mechanical energy direct, avoiding this fearful waste. If that day ever come, our coal supply might be considered unending.

The same spirit of recklessness that leads to waste in mining and in the consumption of coal leads to unnecessary risk of human life. During the year 1907 in the United States the killed and wounded in coal mining operations exceeded 9,000. The danger to life and limb in the mines is increasing far more rapidly than production, because gas becomes more abundant and the work of rescue more difficult as the mines extend deeper or farther from the entrance.

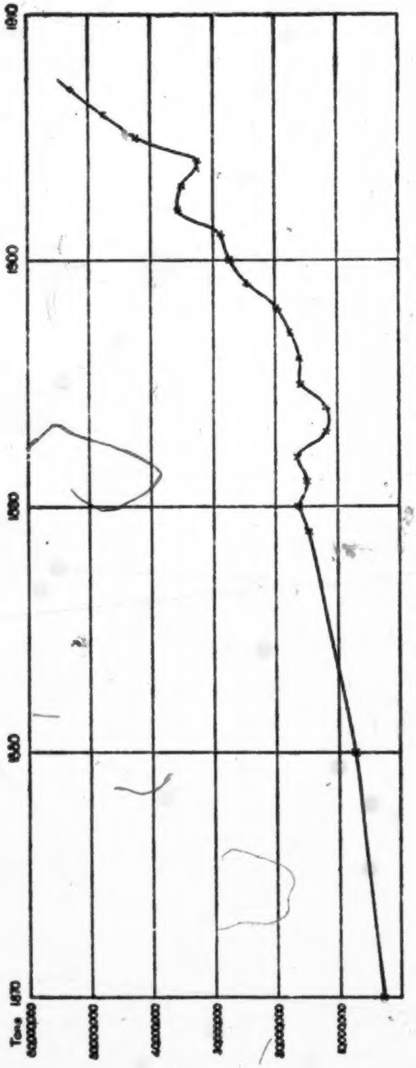
When the Republic was started in 1776, little iron was used. Each family was content with a few score pounds in the form of implements, utensils, and weapons, so that the average annual consumption was but a few pounds per capita. In 1907 alone the production of iron ore in the United States was 53,000,000 tons, or more than 1,200 pounds for each man, woman and child of our 88,000,000 population. And the production is steadily increasing.

The latest trustworthy estimates of our present stock of iron ore are: for the Lake Superior district, about 1,500,000,000 tons; for the Southern district (including Alabama, Georgia, Tennessee and Virginia), about 2,500,000,000 tons; and for the rest of the United States 5,000,000,000 to 7,000,000,000 tons—making an aggregate of about 10,000,000,000 tons.

Our highest-grade ore is that of the Lake Superior district, which yields about four-fifths of the current production. In 1905 its yield was over 33,000,000 tons, in 1906 some 38,000,000 tons, and in 1907 nearly 44,000,000 tons; by the end of the present decade it will average 50,000,000 tons or more. Even without further increase, the known supply will be exhausted before 1940. It is true that there are frequent reports of new ore bodies in this district; but on the other hand, the old bodies generally run far below the estimates.

The total production of iron ore in the United States up to 1890 was some 275,000,000 tons; in the next ten years it was nearly 200,000,000; and in the seven years from 1901 to 1907 more than 270,000,000 tons were produced, or nearly as much as the total for the first century of our history. The aggregate production to date, 750,000,000 tons, is about one-thirteenth of the estimated original supply. At the recent rate of increase (doubling each decade) the production in 1918 will exceed 100,000,000 tons, by 1928, 200,000,000 tons, and by 1938 it will be over 400,000,000 tons—*i. e.*, in that single year, which many of us may expect to see, an amount approximating the entire production in the United States up to the close of last year. By that date about half of the original supply will be gone, and only the lower grades of ore will remain; and all the ore now deemed workable will be used long before the end of the present century.

Compared with Britain or Germany, our only two important competitors in iron and steel, we were until the past few years in much more favorable condition. Britain then was apparently within twenty years



Production of Iron Ore in the United States 1870-1907 of her end as an important steel producer, owing to exhaustion of her ore supplies. Recent discoveries in northern Sweden have given her a new lease and also benefited Germany, both of which are already drawing part of their supply from the new mines which are said to be by far the most extensive ever known. The ores are of excellent quality. It is not improbable that ere long we also in the Eastern States shall be compelled to rely upon these deposits for part of our supply.

While both waste and risk of life in the mining and reduction of iron are much less relatively than in coal mining, the advances in price due to progressive exhaustion are large. An example is found in Iron Mountain, Missouri, which forty-odd years ago was declared, even by experts, to be inexhaustible; the entire deposit is gone—work abandoned. The additional cost of ore due to progressive exhaustion of the bodies of ore can hardly be estimated at less than 10%; this is already felt, and must increase as field after field is exhausted.

Next to iron our most useful metal is copper. It was the only metal used effectively by the natives of North America before Columbus landed; and for over three centuries native copper was mined and wrought by white men chiefly in Indian mines and by Indian methods. The mining and reduction of copper ores has grown up within 50 years; and within a dozen years the copper industry has been revolutionized through electrical application. Although production is enormous and increasing apace, it fails to keep up with the demand, which more than in any other commodity is limited by price. If the current price could be reduced 35% the demand would be doubled or tripled; if it could be reduced 50% copper would replace iron for roofing, cornices, piping, and other constructional purposes so as to raise the demand ten-fold if not more. While the stock of copper in the ground has not been estimated (miners and operators deeming the supply unlimited, just as a generation ago they thought iron inexhaustible), unless the quantity exceeds the indications, it clearly can not long withstand the demands which would follow any great reduction in price. Unless it does so, the use of copper can not seriously check the drain upon our iron resources.

Zinc and lead with silver and other ores abound in our rocks, and their production is steadily increasing. Neither the original supplies nor the time they will last have been estimated; it is known only that one mine or district after another has been worked out, or the depths of the workings so increased as to raise the cost to a prohibitive figure and compel abandonment. The current and avoidable waste in mining and reducing these and the copper ores is estimated by experts to average 30%.

As iron and coal are the bases of industrial values, so gold is the basis of commercial values. Though there is enough gold-bearing mineral in the United States to give this country powerful influence in maintaining parity of gold, the aggregate supply has not been estimated—indeed it can not be, since nearly all rocks and earths and even the waters contain gold in various quantities, so that production is controlled wholly by the market price. Our production is large and steadily increasing; though the increase does not quite keep pace with that of such staples as corn, cotton, wheat, sugar, iron, coal, copper, silver, lead, and zinc. Doubtless the duration of the supply will depend solely upon commercial conditions. The waste in mining and reduction has always been large, ranging from 25% to 50%—indeed it is not uncommon for later miners to get their best returns from working the tailings left by their predecessors.

In view of the sobering facts presented, the thoughtful man is forced to realize, first, that our production and consumption of minerals are increasing much more rapidly than our population; and second, that our methods are so faulty and extravagant that the average waste is very great, and in coal almost as great as the amount consumed. The serious loss of life in the mines is a feature that can no longer be overlooked. Nor can we fail to realize that the most useful minerals will shortly become scarce and may soon reach prohibitive cost unless steps to lessen waste are taken in the interest of the future. [Applause]

I have for many years been impressed with the steady depletion of our iron ore supply. It is staggering to learn that our once-supposed ample supply of rich ores can hardly outlast the generation now appearing, leaving only the leaner ores for the later years of the century. It is my judgment, as a practical man accustomed to dealing with those material factors on which our national prosperity is based, that it is time to take thought for the morrow. I fully concur in the opinion of the President that the state of our resources raises one of the most serious issues now before the American people, and hope that this National meeting will lead to wise action.

We are nationally in the position of a large family receiving a rich patrimony from thrifty parents deceased intestate; the President may be likened to the eldest son and the Governors to younger brothers, jointly responsible for the minors; the experts assembled may be likened to the family solicitors. Now, the first duty of such a family is to take stock of its patrimony; the next to manage the assets in such manner that none shall be wasted, that all be put to the greatest good of the living and their descendants. Now we have just begun to take stock of our national patrimony; and it is with the deepest sense of responsibility imposed on me by the invitation to this meeting, to the nation and to coming generations of all time, that I speak as one of the junior solicitors. In my opinion, we should watch closely all the assets and begin both to save and to use them more wisely. [Applause]

Let us begin with iron: We must in all possible ways lessen the demands upon it, for it is with iron ore we are least adequately provided. One of the chief uses of this metal is connected with transportation, mainly by rail. Moving 1,000 tons of heavy freight by rail requires an 80-ton locomotive and twenty-five 20-ton steel cars (each of 40-ton capacity), or 580 tons of iron and steel, with an average of say ten miles of double track (with 90-pound rails), or 317 tons additional; so that including switches, frogs, fish-plates, spikes, and other incidentals, the carriage requires the use of an equal weight of metal. The same freight may be moved by water by means of 100 to 250 tons of metal, so that the substitution of water-carriage for rail-carriage would reduce the consumption of iron by three-fourths to seven-eights in this department. At the same time the consumption of coal for motive power would be reduced 50% to 75%, with a corresponding reduction in the coal required for smelting. No single step open to us to-day would do more to check the drain on iron and coal than the substitution of water-carriage for rail-carriage wherever practicable, and the careful adjustment of the one to the other throughout the country.

The next great use of iron is in construction, especially of buildings and bridges. Fortunately the use of concrete, simple and reinforced, is already reducing the consumption of structural steel. The materials for cement and concrete abound in every part of the country; and while the arts of making and using them are still in their infancy, the products promise to become superior to steel and stone in strength, durability, convenience, and economy of use. The cement industry is growing rapidly, largely in connection with the making of iron and steel, so that the substitution of the new material will not involve abandonment of plants or loss of invested capital. The hitherto useless slag hills, of which many may be seen around blast furnaces, are now being made directly into cement and yielding high profits. It has become a by-product, the extra cost scarcely more than the former cost of piling the slag away.

A large current use of steel of the highest quality is for battleships, ordnance, projectiles, and small arms. Happily there are signs of an awakening of the public conscience and of the sense of National righteousness, whereby civilized nations must be led to adopt those moral standards which already regulate individual conduct; the world is soon to learn that war is not only too disgracefully inhuman but too wasteful to be tolerated, and this serious drain upon our iron ores will cease.

A promising mode of reducing iron consumption is opening through the development of iron alloys. The making of steel was first an accident, and long a secret "art and mystery;" it was not until after the Republic was founded that steel was recognized as an alloy of iron and carbon, and it was only within the memory of men now present that nickel, silver, zircon, tungsten, and other minerals were scientifically alloyed with iron to yield those protean modern steels adapted to an ever-increasing range of uses. And the end is not yet; every expert knows that metal alloying is in its infancy.

Among the most abundant materials of the earthcrust are silica, alumina, and carbon compounds, all with more or less affinity for iron; already the alloying of carbon with iron has revolutionized the industrial world, and of late the alloying of silicon with iron (in "ferro-silicon," etc.) not only gives promise of yielding a superior metal but suggests the reduction of siliceous ores hitherto unworkable, while aluminum has been alloyed with iron in a useful way. It is not too much to hope that research into the ultimate constitution and relation of these commoner materials will yield both better and cheaper metals than any thus far produced, and that newly discovered alloys will help to relieve the pressure on our mines of iron, copper, zinc, silver and lead.

We now come to coal. How shall we save that? Current uses—or rather current wastes—offer suggestions: The most serious waste arises from imperfect combustion in furnace and firebox. The waste of 90% and over of the potential energy of the fuel in power-production—which, however, we know not yet how to avoid—is appalling in itself, while the smoke and soot from the chimneys becloud and befoul cities, poison human lungs and prepare the way for pneumonia (one of our worst modern scourges), and initiate all manner of additional wastes. We have already learned that internal-combustion engines and gas-producers double or triple the power per unit of coal, obviate the smoke nuisance and also permit the use of lignite, culm, slack, and inferior coals—in fact, so far as power-production by reciprocal engines is concerned, the days of steam seem to be numbered, although the development of substitutes is still in its infancy. The consumption of coal in smelting is necessarily large; of late the loss is reduced by using the furnace-gases for power, and by making by-products; yet the chief saving must lie in economy in the use of metals. Much of our coke-making is still extravagant; some ovens use the gases, and all should do so without delay—if necessary, under State regulation, since the people have some rights both in the preservation of their heritage and in maintaining the purity of the air they breathe. [Applause]

Next to imperfect combustion, the chief waste of coal arises in mining. The early colliers saw no value in coal in the ground, any more than early millers saw value in the flow of the stream; to them coal acquired value only through the labor of mining it, just as to the miller the stream acquired value only as head was produced by the labor of building dam and mill. So the coal taken out in the British and German collieries was a sort of treasure trove; that left in the ground was nobody's loss. Likewise in early American mining the coal mined merely yielded a return for labor, and the pillars and slack and poor coal left in the ground were nobody's affair; it was years after mining began before coal lands were thought to have any other value than as wood-lands or farm-lands. Thus the incredibly wasteful methods were natural enough; if labor could be saved and profit gained by taking out but a third or a half of the richest part of the seam, leaving the rest to be rendered inaccessible by caving, so be it. No one thought of it as improvident. Now that the coal in the ground is recognized as part, and a great part, of the value of coal lands, self-interest impels the operator to take out all he can, and leads the miner to work close to floor and roof. Bad results may sometimes follow, as in the anthracite region, where the entire forest growth has been stripped and both land and streams ruined to timber the mines, and in those terrible accidents when in removing the pillars of coal the miners are buried. Coal mining cries out for expert knowledge whereby the full yield may be obtained without needless risk or loss; and for wise police regulation whereby life may be protected against ignorance and cupidity.

The most promising check on coal consumption is the substitution of other power. Naturalists tell us that coal is a reservoir of solar energy stored up in ages past, and that the same is partly true also of other chemically complex substances, including ores. The sun-motor still runs; its rays render the globe habitable, and may yet be made to produce power through solar engines, or may be concentrated in furnaces—as in the Portuguese priest's heliophore at the St. Louis Exposition with its temperature of 6,000° F., in which a cube of iron evaporated like a snowball in a Bessemer converter. The sun helps to raise the tides, which some day will be harnessed; and still more practically it raises vapor from the sea to fall as rain and supply our mill-streams and rivers, which it is estimated may some day yield over 30,000,000 horsepower—or more than all now produced from fuel by all our engines combined. Dr Pritchett is responsible for the statement that on a clear day, when well above the horizon, the sun delivers upon each acre of the earth's surface exposed to its rays the equivalent of 7,500 horsepower, working continuously. Thus, there is abundance of power lying around us, if we only knew how to harness it. It is only within the past decade that electrical transmission has made water-power generally available for driving machinery, for smelting, and for moving trains, and has at the same time created a new market for copper; yet it is a safe forecast that this method of using solar energy (for such water is as the product of sun-heat) will soon affect the constantly increasing drain on our coal. And just as the woods and the ores and the mineral fuels have become sources of wealth and power within our memory, so will become the running waters within a few years! [Applause]

No practical man can study our mineral supplies without seeing that they are melting away under our national growth at a geometrically increasing rate, and without realizing that unless the loss is checked his descendants must suffer; nor can he consider ways of preserving the supply without realizing the need of wider and deeper knowledge than we now possess. It was not resources alone that gave this country its prosperity, but inventive skill and industrial enterprise applied to its resources. Individually we have been both forehanded and foreminded; nationally we have been forehanded chiefly through the accident of discovery by John Smith and Walter Raleigh, but nationally we are not yet foreminded. So far as our mineral wealth is concerned, the need of the day is prudent foresight, coupled with ceaseless research in order that new minerals may be discovered, new alloys produced, new compounds of common substances made available, new power-producing devices developed. The most careful inventory of the family patrimony should be made. I plead for economy, that the next generation and the next may be saved from want—but especially I urge research into and mastery over Nature, in order that two blades may be made to grow where one grew before, that the golden grain may be made to replace woody grass, that crude rocks may be made to yield fine metals.

I urge on the Executives here assembled as our greatest need today the need for better and more practical knowledge. It was never more true than now that "Knowledge is power." The States have done much, the Federal Government has done much, individual men have done much for research; in the history of this country knowledge has advanced as never before, and thereby the materials and forces of Nature have been brought under control as no man dreamed when the nation was founded. Yet if our career of prosperity is to continue, it must be on the basis of completer control of national sources of material and power than we have thus far exercised, a control to be gained only by research. [Applause]

In conclusion, Mr. President and Governors of our States, it seems to me our duty is:

First, conservation of forests, for no forests, no long navigable rivers; no rivers, no cheap transportation. [Applause]

Second, to systematize our water transportation, putting the whole work in the hands of the Reclamation Service, which has already proved itself highly capable by its admirable work. Cheap water transportation for heavy freights brings many advantages and means great saving of our ore supplies. Railroads require much steel, water does not. [Applause]

Third, conservation of soil. More than a thousand millions of tons of our richest soil are swept into the sea every year, clogging the rivers on its way and filling our harbors. Less soil, less crops; less crops, less commerce, less wealth. [Applause]

The way is not new: Washington and his compatriots pushed into the unknown in projecting a nation on new principles. Franklin grasped a hardly known principality through the Geneva Treaty, and Jefferson seized an unexplored half-continent despite protests of those whose knowledge was even less than his own; Fulton, Morse, Henry, Edison and Bell came to stand as kings among men by pushing into the unknown. Today the time is ripe for a further advance; our President, with far-sighted patriotism, has arisen to lead effort and action. He deserves, and I am sure will receive, your earnest support and that of all citizens who understand the importance of the problems involved. [Applause]

Governor GLENN. Mr President, at the instance of our Forestry Committee, I simply want to offer a resolution and have it referred, so that the committee appointed this morning can act on it before tomorrow morning.

The PRESIDENT: The resolution will be referred accordingly.

Governor FOLK: I desire to offer the following resolution, and ask that it be referred to the Committee on Resolutions.

The PRESIDENT: The resolution will be properly referred.

Governor BLANCHARD: Mr President, I would ask on behalf of the Committee on Resolutions that all Governors and members of the Conference who have resolutions they desire to send up will do so if possible this afternoon. The Committee on Resolutions desires to get to work.

The PRESIDENT: I would suggest that if it is impracticable to prepare resolutions in time to present here, they be presented to the Committee without being formally presented during the sessions, so as to economize time.

Mr RANSDELL: Mr President, I move that all resolutions be referred to the Committee on Resolutions without reading.

The motion was seconded, as in accord with the understanding when the Committee was appointed; and the question being demanded, the motion was put and was agreed to without dissenting voice.

The PRESIDENT: Gentlemen, Governor Noel will now take the chair; and Dr White will address the meeting.

Governor NOEL then took the chair as Presiding Officer for the session.

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THE WASTE OF OUR FUEL RESOURCES

I. C. White

STATE GEOLOGIST OF WEST VIRGINIA

Mr President, Governors, and Gentlemen:

A great geoglogist once said, "The nations that have coal and iron will rule the world." Bountiful nature has dowered the American People with a heritage of both coal and iron richer by far than that of any other political division of the earth.

It was formerly supposed that China would prove the great storehouse from which the other nations could draw their supplies of carbon when their own had become exhausted, but the recent studies of a brilliant American geologist in that far-off land, rendered possible by the generosity of the world's greatest philanthropist, tell a different story. The fuel resources of China, great as they undoubtedly are, have been largely overestimated, and Mr Willis reports that they will practically all be required by China herself, and that the other nations can not look to her for this all-important element in modern industrial life.

A simple glance at a geological map of the United States will convince any one that nature has been most lavish to us in fuel resources, for we find a series of great coal deposits extending in well scattered fields almost from the Atlantic to the Pacific and from the Lakes to the Gulf, while even over much of New England and the coastal plains vast areas of peat, the primal phase of coal, have been distributed. But coal of every variety from peat to anthracite is not all of nature's fuel gifts to fortunate America: great deposits of both petroleum and natural gas occur in nearly every State where coal exists, and in some that have no coal. What greater dowry of fuels could we ask when we find them stored for us within the bosom of our mother earth in all three of the great types, coal, petroleum and natural gas, only awaiting the tap of the pick and drill to bring them forth in prodigal abundance?

What account can we as a Nation give of our stewardship of such vast fuel treasures? Have we carefully conserved them, using only what was necessary in our domestic and industrial life, and transmitted the remainder, like prudent husbandmen, unimpaired to succeeding generations? Or have we greatly depleted this priceless heritage of power, and comfort, and source of world-wide influence, by criminal waste and wanton destruction? The answer should bring a blush of shame to every patriotic American; for not content with destroying our magnificent forests, the only fuel and supply of carbon known to our forefathers, we are with ruthless hands and regardless of the future applying both torch and bomb to the vastly greater resources of this precious carbon which provident Nature had stored for our use in the buried forests of the distant past. The wildest anarchist determined to destroy and overturn the foundations of government could not act in a more irrational and thoughtless manner than have our People in permitting such fearful destruction of the very sources of our power and greatness. Let me enumerate some of the details of this awful waste of our fuel resources that has been going on with ever increasing speed for the forty years last past.

First let us consider how we have wasted Natural Gas—the purest form of fuel, ideal in every respect, self-transporting, only awaiting the turning of a key to deliver to our homes and factories heat and light and power. Partial Nature has apparently denied this great boon to many other lands. It is practically unknown in France, Germany and Great Britain, our chief competitors in the world of industry. Even wood and coal must first be converted into gas before they will burn, but here is a fuel of which nature has given us a practical monopoly, lavish in abundance, already transmuted into the gaseous stage and stored under vast pressure to be released at our bidding when and where we will. The record of waste of this best and purest fuel is a national disgrace.

At this very minute our unrivaled fuel is passing into the air from uncontrolled gas wells, from oil wells, from giant flambeaus, from leaking pipe-lines, and the many other methods of waste at the rate of not less than 1,000,000,000 cubic feet daily and probably much more.

Very few appear to realize either the great importance of this hydrocarbon fuel resource of our country, or its vast original quantity. Some of the individual wells, if we may credit the measurements, have produced this fuel at the rate of 70,000,000 cubic feet daily, the equivalent in heating value of 70,000 bushels of coal, or nearly 12,000 barrels of oil. In my humble opinion the original amount of this volatile fuel in the United States, permeating as it does every undisturbed geologic formation from the oldest to the most recent, rivaled or even exceeded in heating value all of our wondrous stores of coal.

Suppose that it were possible for some Nero, inspired by a mania of incendiarism, to apply a consuming torch to every bed of coal that crops to the surface from the Atlantic to the Pacific, and that the entire coal supply of the Union was threatened with destruction within a very few years, what do you think would happen? Would our State Legislatures sit undisturbed, panoplied by such a carnival of fire? Would the Governors of 30 States remain silent while the demon of flame was ravaging the coal resources of the Republic? Certainly not; there would be a united effort by the Governors and Legislatures of all the States in the Union to stay the progress of such a direful conflagration; even the sacred barriers wisely erected between State and Federal authority in the Constitution would melt away in the presence of such an awful calamity, and the mighty arm of the Nation would be invoked to help end the common peril to every interest. And yet this imaginary case is an *actual one* with the best and purest fuel of the country, equal probably in quantity and value for heat, light, and power to all of our coal resources. This blazing zone of destruction extends in a broad band from the Lakes to the Gulf, and westward to the Pacific, embracing in its flaming pathway the most precious fuel possessions of a continent. No one can even approximate the extent of this waste. From personal knowledge of conditions which exist in every oil and gas field, I am sure the quantity will amount to not less than 1,000,000,000 cubic feet daily, and it may be much more. The heating value of a billion cubic feet of natural gas is roughly equivalent to that of 1,000,000 bushels of coal. What an appalling record to transmit to posterity!

From one well in eastern Kentucky there poured a stream of gas for a period of 20 years, without any attempt to shut it in or utilize it, which was worth at current prices more than $3,000,000. Practically the same conditions characterized the first twenty-five years of Pennsylvania's oil and gas history, and the quantity of wasted gas from thousands of oil and gas wells in western Pennsylvania is beyond computation. In my own state of West Virginia, only eight years ago, not less than 500,000,000 cubic feet of this precious gas was daily escaping into the air from two counties alone, practically all of which was easily preventable by a moderate expenditure for additional casing. When it is remembered that 1,000 cubic feet of natural gas weighs 48 pounds, and that 6,000 cubic feet of it would yield a 42-gallon barrel of oil when condensed, so that a well flowing 6,000,000 feet of gas is pouring into the air daily the equivalent of 1,000 barrels of oil, what would our petroleum kings think if they could see this river of oil (for the equivalent of 1,000,000,000 feet of gas is more than 160,000 barrels of petroleum, and of practically the same chemical composition as benzine or gasolene) rushing unhindered to the sea? Would they not spend millions to check such a frightful waste of this golden fluid? And would they not be the first to appeal to the National Government for aid in ending such stupendous destruction of property? And yet because natural gas is invisible, and its waste is not so apparent to the eye as a stream of oil or a burning coal-mine, the agents of these oil magnates have not only permitted this destruction of the Nation's fuel resources to continue, but even have prevented by every means in their power the enactment of legislation to stop this frightful loss of the best and purest fuel that Nature has given to Man.

There can be no doubt that for every barrel of oil taken from the earth there have been wasted more than 10 times its equivalent in heating power, or weight even, of this best of all fuels; and that much more than half of this frightful waste could have been avoided by proper care and slight additional expenditures in oil-production.

In justice to the great oil-producing corporations it must be acknowledged that they have not permitted much waste of petroleum except what has been sprayed into the air by their awful waste of gas, and also that their handling of petroleum has been from the beginning, a model of business economy and management. The great mistake of the oil producing interests has been in not properly apprehending the enormous fuel value of the natural gas they were destroying, and in not demanding legislation for its protection instead of successfully throttling and preventing it in every state of the Union except one—Indiana. When the people of that great state awoke to the fact that their richest mineral possession was being rapidly wasted, they rose to the occasion, and although it was largely a case of "Locking the stable door after the horse was stolen," they effectually prevented any further useless waste of natural gas. This Indiana statute, which has been declared constitutional by our highest courts, says in effect to the oil producers, "You can not take the oil from the ground, where Nature has safely stored it, until you provide a method of utilizing the accompanying gas or volatile oil as well;" and it also says to both the producer and consumer of natural gas, that it is against "Public policy to waste this valuable fuel, and that it will not be permitted to either party." This Indiana statute for the conservation of petroleum and natural gas should be enacted into law in every State where these precious fuels exist. Why has it not been done? Let the answer be found in the history of my own state, where the waste of natural gas has been exceeded only by that of our sister State of Pennsylvania.

For ten years your speaker has appealed in his official capacity as State Geologist to the Legislature of West Virginia to put some check on this frightful waste of our State's most valuable resource. Three patriotic Governors, including our present able Executive, Governor Dawson, have in every biennial message besought the Legislative branch to end this criminal destruction by appropriate legislation; but some unseen power greater than Governor or Legislature has so far thwarted and palsied every effort to save to the State and the Nation this priceless heritage of fuel, so that although five successive Legislatures have attempted to deal with the question in biennial sessions, not an effective line has yet been added to the statutes—and at this very hour not less than 250,000,000 cubic feet of gas, and possibly more than double that quantity, is daily being wasted in this one State alone, 80 per cent of which is easily and cheaply preventable.

Why should a few oil producers in their insane haste to get rich quickly, or add to fortunes already swollen beyond safety to the Republic, be permitted thus to despoil the entire country of its choicest fuel?

But surely if men have thus permitted the loss of our gaseous fuels, often because they could neither see the substance itself nor realize the extent of what they were doing, certainly they would not be so wasteful of the solid fuels, the coal beds, something they can readily perceive and handle and weigh? The record here is also one to make every citizen of our Nation feel distressed and humiliated, for of the total quantity of coal we have produced since mining for commercial purposes began, amounting to above 5,000,000,000 tons, at least an equal amount and possibly more has been left in abandoned mines and irretrievably lost. You who are unacquainted with the details of mining operations and of the structure of coal beds will doubtless wonder how such a vast loss of fuel could take place. There are many causes for this enormous waste in the extraction of coal. Let me enumerate a few of them:

First: The individual coal bed is not all pure coal, and this is especially true if it be very thick. Some of it consists of layers of sulphurous or bony coal, rich in carbon, but containing more ash, sulphur, or earthy material than first class coal should hold; and the purchaser refuses his patronage to the party who sends him coal high in ash. There being no market for such coal, the operator leaves it unmined if it be in either the roof or bottom of his coal bed; and if it be interstratified with the pure coal, as frequently happens, he simply throws it along with other mine refuse into the gob-heaps within the mine, or piles it in the hillocks of culm containing shale, clay, and other waste material at the entrance. The quantity of this impure coal varies from 10% to 50% in nearly every coal bed, and it would probably average 25% in all the mines of the country. This material is rich in carbon, both fixed and volatile, and when utilized through the agency of producer gas and the gas-engine will yield much more power than the same weight of the best Cardiff or Pocahontas coal when the steam-engine is the agency of conversion. Why should our great manufacturing industries permit one-fourth of our entire coal resources to be thus wasted and permanently lost when the researches of the Technical Branch of the United States Geological Survey have fully demonstrated the practicability of converting these impure coals into great sources of power? If in all new installations provision were made for the use of gas-engines a large portion of these impure coals could be utilized, and our purer types of fuel could be preserved for other purposes.

Second: In the mining of coal, it is necessary to support the overlying strata over large areas of the mine in order that the coal may be even partially taken out; and hence it is the common mining practice temporarily to utilize about 50% of the solid coal itself in the shape of supporting pillars for the protection of roadways, air courses, working rooms, etc. On account of accidents, like falling roof-rock, "squeezes," "creeps," "crushes," mistakes in mine engineering, bad roof, and other causes, many of these huge pillars are frequently submerged and surrounded with broken rock material, and thus another large proportion of every coal bed (varying from 10 to 50%) is utterly lost; so that approximately 25% more of the Nation's coal resources is wasted from these largely preventable causes.

With 50% of our coal left in the abandoned mines from which it can never be recovered except at enormous expense, one would think that the end had come to wanton destruction of our coal resources, but not so; a third means, and one of unknown extent, has yet to be considered: Some of the impure layers of coal may have a still larger percentage of earthy matter, and then they become partings of shale, the fossil muds and soils borne into and spread over the ancient peat-bogs by the draining streams of geologic time. These partings vary in thickness from a few inches to several feet. When thin, not exceeding 6 to 12 inches, the usual mining practice is to take them out and secure the coal; but where they attain a thickness of 18 to 24 inches, their removal entails too much expense for the production of bituminous coal under present commercial conditions, and hence the parting is not removed, and the underlying or overlying coal (as the case may be), is left in the mine usually in such a condition as to be practically irrecoverable. These parting shales often occur near the middle of the coal seam, and thus one-half of the bed will remain buried in mine rubbish with no possibility of ever securing its precious fuel. Very much akin to this is another kind of waste, of which we as yet cannot even approximate the extent. It is well known that in very rich coal fields several (3 to 10) beds of coal may overlie each other in the same mountain, separated by from 5 to 200 feet of rock material. It often happens that the thickest and best of the beds may underlie all the others, and hence will be the first one mined, regardless of the fact that when the overlying strata breaks down, some and possibly several of the higher coal beds being so dislocated and disturbed and their areas so permeated with deadly gases from the abandoned mines below that much of this higher coal will be lost—just how much no one yet knows, though the fuel waste from this source must be large. Of course nearly all of this loss could be prevented by mining the higher beds first. Another deadly peril to deep coal mining is an incident of oil and gas production. Thousands of holes have been drilled through the coal measures to reach the productive oil and gas zones below. Many of them have found only natural gas, and unless the well was very large or a profitable market near at hand, the casing has been drawn and the well abandoned. It is greatly feared that in such cases, another great menace will be added to the coal mining industry, since these abandoned oil and gas wells which penetrate the coal measures are numbered by the thousand, and no accurate public charts of the same have ever been kept.

The same story of waste of fuel comes from every mining center. The experts of the United States Geological Survey report the quantity of fuel left unmined in the ground all the way from 40% to 70% of the total deposits. I shall not worry you with details from all over the country, but shall illustrate the rapid exhaustion of our fields by special reference to one great district, with which many of you are personally familiar.

The mining of bituminous coal and the manufacturing industries dependent thereon originated at Pittsburg only about a century ago, and her citizens as well as all others may learn a useful lesson by recalling the history of this beginning. The earliest settlers found there cropping high in the steep hills which border the Monongahela river a thick bed of splendid coal. As roadways could not be constructed to the inaccessible cliffs where the coal was first discovered, some other method of securing it was necessary. At that time the buffalo roamed the vast plains of the middle West in countless millions, and these animals were so abundant even in the Pittsburg region that their skins were used for conveying the coal from the mines to the factories in the valley below, a few bushels of coal being sewed up in each hide and then rolled down the steep slopes. To our forefathers the supply of buffalo appeared "inexhaustible," and yet less than a century of wanton slaughter has practically exterminated this noble animal. This passing of the buffalo illustrates in a striking way what will just as surely happen to vast areas of our fuel resources, great as they are, even within the limits of the present century—unless our people awake to what they are doing and make a determined effort to stop their destruction. The people generally have been so often told of their "inexhaustible" supplies of fuel that its waste has not impressed them as a problem worthy of serious thought. They have generally believed that exhaustion was so remote that even its consideration concerned the present only in an academic way. Let us see about that. We shall take for our illustration the Appalachian coal field, which is conceded by all to be the richest in fuel of any on the continent. It is also the most important to the welfare of the country, since it is nearest the seaboard, and since it contains the vast bulk of our good coking coals upon which our pre-eminence in the iron and steel industry depends. With the exception of a few narrow strips close to regions of rock disturbance or folding in our western country, no first-class coking coals have yet been discovered in the United States outside of this Appalachian basin.

It has long been recognized by all that the Pittsburg district is located in the heart of the Appalachian field where fuel of every description is most abundant, and most accessible. You will pardon a personal reminiscence which illustrates how an eminent political economist regarded this favored region: It was my good fortune to accompany the lamented

Blaine up the beautiful Monongahela river the last time that he visited his boyhood home, some twenty-odd years ago. He had acquired 1,100 acres of Pittsburg coal lands in the vicinity of Elizabeth, about 22 miles above Pittsburg; and the party stopped there a few hours to permit Mr Blaine to examine his property—which he termed his "savings bank," since he had acquired it by the occasional purchase of small farms during a period of several years. Being curious to know why he had made an investment of this kind so far removed from his home in Maine, I asked him how it happened. His reply impressed me deeply, because it contained a prophecy. He said that cheap fuel was the most important element in the life of a Nation, and that in looking the country over he had concluded that there was more of it easily accessible to the Pittsburg region than in any other portion of the country, so that the Pittsburg district would sometime become the manufacturing center of the world and that investments in its coal fields could not fail to prove remunerative. The prophecy of that far-seeing statesman was fulfilled much sooner than even he expected, since Pittsburg has certainly held first place among the work-shops of the world for the last decade. It is not generally known that the tonnage originating in the Pittsburg district and passing through it now exceeds that of the four greatest seaport cities of the world—London, New York, Liverpool, and Hamburg—combined; so that not only Pennsylvania but every State in the Nation is interested in perpetuating this empire of industry which our wonderful natural resources and the genius of the American people have conquered. How long can we hope to maintain this industrial supremacy in the iron and steel business of the world? Just so long as the Appalachian coal-field shall continue to furnish cheap fuel; and no longer. If the wasteful methods of the past are to continue; if the flames of 35,000 coke ovens are to continue to make the sky lurid within sight of the city of Pittsburg, consuming with frightful speed a third of the power and half of the values locked up in her priceless supplies of coking coal, the present century will see the termination of this supremacy. Many of you may not credit this statement, so let us do some figuring as an aid in forecasting the future. All will admit that no portion of the Appalachian field is richer in fuel resources than the Pittsburg district, and if we can estimate approximately how long its fuel will last, we shall have gaged in a rough way the productive life of the Appalachian field.

The Pittsburg Coal Company owned on January 1st, 1908 (according to its recent annual report), 143,000 acres of the Pittsburg coal-bed, or practically one-seventh of the entire acreage of this famous seam remaining yet unmined in Pennsylvania. During the year it exhausted 2,241 acres, obtaining therefrom for all purposes 18,000,000 tons of coal, or an average of 8,000 tons to the acre, leaving in the ground about 5,000 tons per acre of waste and unmined fuel. Hence this average of 8,000 tons may be taken as a measure of the total amount of first-class fuel that will be won under present mining methods from each acre of Pittsburg coal yet remaining unmined in the Pittsburg district.

In 1906, Pennsylvania produced 109,000,000 tons of bituminous coal, 84,000,000 of which came from the five counties of Allegheny, Fayette, Greene, Washington and Westmoreland, which hold practically all of Pennsylvania's Pittsburg coal area. In 1907 Pennsylvania produced 129,000,000 tons of bituminous coal; and in the absence of exact statistics it is safe to say that at least 100,000,000 tons of this product came from the five counties in question, and not less than 95,000,000 tons of it from the Pittsburg seam.

There remains unmined in Pennsylvania only 1,100,000 acres of this great coal bed, or a total available product of 8,800,000,000 tons of coal measured by the quantity (8,000 tons per acre) obtained by the best mining methods of a great corporation during 1907. This 8,800,000,000 divided by 95,000,000 yields a quotient of only 93 as the number of years this fuel in the Pittsburg seam will last if the present annual production should not be increased by a single ton. But who is there to say it will not be doubled even within the next decade?

The West Virginia productive area of this great bed is only about the same as that of Pennsylvania, so that this contiguous region can add only a few years to the life of the Pittsburg coal production.

It may be claimed that the Allegheny series of coals which underlie the Pittsburg bed may add greatly to the fuel resources of the Pittsburg district. This is an error, since the coals in the Allegheny and Conemaugh series appear to thin away and disappear as commercial propositions when they pass beneath the principal areas of the Pittsburg coal; while the active demand for coal at the seaboard will exhaust all of the productive areas of these lower and thinner coals, with our present wasteful mining methods, even before the Pittsburg bed fails.

The productive coal area of the Appalachian basin has been greatly over-estimated in every one of the six great states through which it passes from Pennsylvania to Alabama. The drill of the seeker for petroleum and natural gas, while it has wasted untold millions of precious fuel, has taught one useful lesson, viz: that there is a wide area, 50 to 75 miles in breadth, deep down in the center of the Appalachian basin, that is practically barren of commercial coal. This barren area begins with the lower measures just north from Pittsburg, and, embracing large portions of the former supposed coal fields of both Ohio and West Virginia, passes southwestward into Kentucky, having a breadth of 25 miles where it enters that state.

To what extent the productive area of Kentucky, Tennessee, and Alabama will be affected by the southward extension of this barren belt, which has already cut the former estimates of Pennsylvania, Ohio, and West Virginia in half, we do not yet know; but certain it is that all the great coal formations, instead of holding productive coal entirely across this great basin as formerly supposed, are productive only as fringes 20 to 30 miles in breadth around the borders of the basin, while the great central trough is practically destitute of valuable coal. Hence with only a reasonable estimate for increased coal production, if the present wasteful mining methods continue, there will be but little coal for manufacturing purposes within 100 miles of Pittsburg at the opening of the next century, and practically no cheap fuel left in the entire Appalachian basin with which to maintain our supremacy in the iron and steel trade of the world.

The prospect is not a pleasing one to contemplate. That celebrated word-picture of Lord Macaulay in which he describes a future traveler as standing on a broken arch of London Bridge, in the midst of a vast solitude, sketching the ruins of St. Pauls, may find its substantial counterpart much nearer home than we could wish. True, the natural wealth of our beloved Union is so great and varied; our riches of soil, of forest, and of stream are so vast if preserved and their boundless possibilities thoroughly utilized, that we would probably have the advantage of all other nations in the struggle for existence, even after our fuel resources have been exhausted; but this is no reason why we should not do everything possible to conserve them so that we may retain to a remote future the great benefits which their possession assures.

Honorable Governors of the several States, the questions involved in this discussion are those in which you and your constituents are most vitally interested. Our patriotic President, ever watchful of the Nation's welfare and of the People's interests, ever alert to guard against dangers from without or the more insidious foes that would betray the People's liberties from within, has summoned you to a conference more important to the future of our Great Republic than any council that has ever before met in the history of our country. Our honored President would protect this Nation, not alone from perils on the ocean, but from the graver ones on land. The dangers that confront us on the Pacific as well as the Atlantic are serious and of far-reaching importance to the future of our country; and the People's President, under whose wise administration there is happily no North, no South, no East, no West, and to whom in his official capacity the rights of all citizens, whether rich or poor, white or black, look alike, will be sustained by a united country in the request which he has made of Congress to provide "big sticks" in the shape of an adequate navy for both oceans as the surest and best guarantee of either peace or respect from the other nations of the earth. But the dangers that confront the great Republic from abroad are as nothing compared to the perils that lurk in the shadows at home. What will it profit this nation to have won the wreath of industrial supremacy, if in our thirst for gold and sudden riches we permit corporate greed, as well as individual avarice and selfishness, to waste and devastate the very sources of our prosperity? For just as sure as the sun shines, and the sum of two and two is four, unless this insane riot of destruction and waste of our fuel resources which has characterized the past century shall be speedily ended, our industrial power and supremacy will, after a meteor-like existence, revert before the close of the present century to those Nations that conserve and prize at their proper value their priceless treasures of Carbon.

Whatever is possible in the shape of legislation for the protection ot our fuel resources should be done by the individual States which you represent. Twenty-nine of the 46 States of the Union produce coal; 24 of these produce more than a million tons annually, while practically the same number produce vast quantities of both petroleum and natural gas. The percentage of coal left in the ground beyond recovery, as we have seen, varies from 40 to 70 in the different fields, to say nothing of the wasteful and extravagant use of the portion extracted; while the waste of natural gas, the most precious fuel of all, is so vast that no one can even approximate the percentage. The task before you and your constituencies is indeed formidable. The forces of greed and selfishness are so entrenched behind corporate power and influence that to attack them may often appear to you useless as the labors of Sisyphus; but as you love your States and Country, I adjure you to take up this fight for the conservation of our fuel resources with the determination never to surrender until the forces of greed and avarice which are so rapidly sapping the very foundations of our country's greatness capitulate, and agree to end the wild riot of destruction that has characterized the past.

Mr. President, I greatly regret that the part assigned to me in this discussion has led along such unpleasant lines. The story of the awful waste of our most valuable natural resources is one of such a disgraceful character that its exposition to the world is necessarily mortifying to all patriotic Americans; but a sense of duty to our common Country demands that the truth be told, however humiliating to our national pride.

This Conference will not have met in vain if it shall result in awakening public sentiment to the peril which overshadows the Republic in this uncontrolled waste and dissipation of our fuel resources. These eminent Governors whom you have summoned to hear this narrative of rapine and devastation, to many of whom the story is new and almost unbelievable, owe you a debt of gratitude which they can only adequately repay by arousing the citizens in their respective States to such a realization of the gravity of the dangers which follow in the wake of unbridled waste that whatever is possible for legislation to accomplish may be speedily enacted into law. Forewarned is forearmed; and this Conference which has brought together so many influential citizens from every State in the Union should not fail to be productive of untold good to the Nation's future.

Dr McGee: Mr Chairman, allow me to say that a number of printed copies of the statements by Mr Carnegie and Dr White are within reach for those who desire to discuss them, and that an ample supply will be within the reach of all Conferees before the day is over.

The Presiding Officer (Governor Noel): General discussion will be opened by Mr Mitchell, who will be followed by Mr Bryan, and then by others.

GENERAL DISCUSSION

Address by John Mitchell

Mr President and Gentlemen:

In discussing the conservation of our natural resources, I shall confine my remarks to that phase of the question with which I am most familiar.

It has been well said that—

> Coal is the earth's great storage-battery of solar energy. In the Nation's welfare it represents the basis of the heat, power, and light upon which the Nation's comfort and the Nation's industries depend. Man may replant the forests, and the rivers will resume their courses to the sea; but the vegetation necessary to produce coal cannot be restored, once it has been exhausted.

Mining experts predict that under present methods of production the coal deposits of the United States will be entirely exhausted within two hundred years. It is contended by many competent investigators that 50% of our coal supply is destroyed or wasted because it is impracticable or unprofitable to mine it under present commercial conditions. From observation and experience, I am constrained to believe that this estimate is too high. I am convinced, however, that by the present methods of mining not less than 25% of the coal in mines that have been developed is lost beyond hope or possibility of recovery.

The production and consumption of coal must be considered largely from a commercial standpoint. The thin seams of coal and the thicker seams in mines where the physical conditions are unfavorable, or where the coal is of an inferior quality, cannot be mined or marketed profitably unless perchance they are located in close proximity to great centres of industry.

The low cost at which coal is produced and the low price at which it is sold to large consumers is the most pronounced incentive to waste and extravagance. If American manufacturers and other great consumers were required to pay a higher rate for fuel, it would enable mining companies to produce and prepare for market countless millions of tons of coal which under present conditions are left in the ground, lost to the present and future generations. Consumers of coal in other countries pay from one and one-half to two and one-half times as much for fuel as is paid by American manufacturing and railroad companies. In other words, large corporations in our country purchase bituminous coal at the mines for less than one dollar per ton, while like concerns in other countries pay from two to three dollars per ton.

It is, of course, important to the well-being and prosperity of all our People that large consumers be furnished a fuel supply at a cost sufficiently low to enable them to compete in the world's markets with manufacturers in other countries; but when one considers the tremendous waste of energy that accompanies the use of cheap fuel, the conclusion is inevitable that this very cheapness is an extravagance and not an economy. As a matter of fact, by reason of improper firing and imperfect furnaces, three tons of coal are consumed in creating the power which under proper conditions would be generated by the use of one ton.

The great waste in the production of coal does not at all approximate, however, the waste and extravagance in its consumption. It is interesting to note that under the present process of burning, only from 5% to 10% of the heat-units in bituminous coal are utilized, the remaining 90% or 95% being wasted. If it were possible to utilize all the heat-units, our coal supply, which experts predict will be exhausted by the close of the next century, would last for more than two thousand years; and while the ingenuity of man may not be able to devise a method whereby all the heat-units in the coal shall be utilized, it is quite within the range of probability that a system will be evolved by which 75% of its energy will be used for heating, power, and lighting purposes. Indeed, at the present time, through a process of converting coal into gas instead of firing the coal direct, it has been demonstrated that 50% of the heat-units can be used in generating motor power. The general adoption of this method of using coal would insure a fuel supply for at least one thousand years, even though there were not further improvements in methods of consumption and no greater economy in production.

While it may not be within the province of the Government or of the State to regulate the cost at which coal shall be produced or the prices at which it shall be sold, it seems to me that much good would result by continuing and extending the investigations which are being made relative to methods of production and consumption and the waste attendant thereon.

The present generation has no moral right to destroy these resources which were not created by Man or given solely to us. Our extravagant wastefulness in the use of our fuel supply, both in production and consumption, is equalled only by our criminal disregard of the personal safety and the lives of the men who toil in the mines. For every 190,000 tons of coal produced, a mine worker is killed and several are seriously injured; for each 1,000 men employed, 3.40 are killed annually. Last year nearly 2,500 men were killed and more than 6,000 were seriously injured in the mining industry of our country. No other country in the world shows so large a percentage of fatalities. Indeed, in those foreign countries in which mining is most hazardous the proportion of men killed to the number employed is from 50% to 75% less than in our country. It is a sad commentary on our vaunted civilization that more men are killed or crippled in mining in the United States than in any other nation on earth.

In our mad rush for spoils and profits, we not only waste and destroy those material resources with which God has so bountifully endowed us, but we press forward in the race sacrificing also, unnecessarily, the lives and the comfort of our fellow-beings.

It seems to me that the time has come when we should stop for a moment to think—not alone of those inanimate things that make for comfort and prosperity, but also of the men and the women and the children whose toil and deprivation have made and will continue to make our country and our people the most progressive and the most intelligent of all the nations and of all the peoples of the earth.

The PRESIDING OFFICER (Governor NOEL): The regular program being exhausted, Mr Bryan will lead the general discussion.

Mr BRYAN: Mr President, there are Governors here from the States which are closely identified with the coal and iron supplies, and I prefer to leave them to discuss this question and reserve what I have to say until Friday, when I can speak of forestry and of land and water transportation.

The PRESIDING OFFICER: Gentlemen, you have heard Colonel Bryan's statement; he prefers to deliver his address, on the subject of forestry and water transportation, on Friday. General discussion is now in order. It has been suggested that the Governors now be heard, and we shall be glad to hear from any of them on any matter pertaining to the subjects on which papers have been presented.

Governor JOHNSON: Mr President——

The PRESIDING OFFICER: Governor Johnson is recognized. Governor, will you not take the platform?

Governor **Johnson**: Mr President, I have only a few words to say, and if agreeable I should prefer to say them from this position.

The **Presiding Officer**: The Gentlemen present will prefer to look you in the face, Governor. Please come to the platform. [Applause]

Governor **Johnson** (on taking the platform): My purpose was really to ask another gentleman to discuss the question; but now that I have been called to the platform, I gladly offer a few remarks of my own.

ADDRESS BY JOHN A. JOHNSON

GOVERNOR OF MINNESOTA

Gentlemen:

Two propositions have been submitted, one relative to coal and the other to iron. The Governor of Minnesota, if anyone here, should be in a position to speak, and certainly ought to be able to say something of the iron industry of the country; and I apologize for not being in possession of the information which I ought to have, to speak with that intelligence which has preceded me, and which has been so delightfully illustrated by Mr Carnegie and the gentleman who followed him.

I have been very seriously impressed in the few hours during which we have been together. It does seem to me, if all that has been said is a fact, and I assume it to be a fact, that the sun of the prosperity of America seems to have reached the summit, and that the shadows are beginning to find their place on the other side of the hill; and while I realize it is going to make no particular difference to us of this generation, the great patriotic duty devolves on us and the people of the country as a whole, to do that which is going to work out some solution of the various problems for the future, whether that is to be a hundred years or two hundred years.

I know nothing whatever about the coal end of this discussion. The word "waste" has been used in connection with, I think, both the mining of iron and the mining of coal, but not in the same degree. I am rather of the opinion that so far as we are concerned in the north, up along the Lake Superior northern shore there is not that waste which the public might infer from the discussion as it has so far proceeded. I think during the old days on the Vermillion Range—and I believe Dr Van Hise will bear me out in this—there was some waste where the underground mining, as it extended, gave way to the cave-in, and the mines were deserted; but on the Mesabi Range, which is west of the Vermillion Range, and not very far removed from it, the mining is largely of the open pit character, where it would resemble more closely the usual limestone quarrying.

There the iron is mined with steam shovels at the rate of 50 tons in 3½ minutes out of the native bank, and put in the cars, where nature, by the law of gravitation, has made it possible for the companies to haul down all the loaded cars which they can haul back empty, minimizing the cost of transportation. I doubt whether there is any waste at all. Possibly the stock piles contain some of the lower grades of ore, but very little of it; so that, so far as Minnesota is concerned, waste is not in question. The mining on the Mesabi and Vermillion Ranges, I am sure—and I think this is equally true of the ranges along the southern shore—is as scientific as it could possibly be, and that it is not excelled in the care with which it is conducted anywhere in the world.

I am rather inclined to contradict some of the statements that have been made, if I might be permitted to do that as a thorough novitiate; I am rather a stranger in the realm of iron to contradict any presumption or opinion which Mr Carnegie might have. Certainly he ought to have as much knowledge on the subject as any other man in this country except possibly Mr Hill, who I am sure will be glad to take issue with him on certain things. [Laughter]

Twenty years ago the Mesabi Range was scarcely known. It had been covered with this dense forest which is also a subject of controversy before the Conference. If the forest there had been conserved, and had been set aside for a preserve, the iron resources of the country would not have been developed. The forests gave way, and finally some man discovered the red ore of the Mesabi Range. The geologists were invited to go in there and look it over, and to analyze and observe the specimens. They declared it was not a merchantable ore; that it was not of any value at all. Within twenty years the judgment of the geologists has been entirely disproved, because it has come to be known as the greatest iron region on this hemisphere, and the ore is of a very high grade.

At that time the region was comparatively little known. I think some eight or ten years ago Mr Schwab, who was connected with one of the companies in which Mr Carnegie was interested, said on the stand that there was something like a billion tons of ore in that region. Mr Carnegie says it is a billion and a half tons. I am quite sure if there has been the growth of half a billion tons in five or six years, there will not be any necessity for conservation of that resource. [Laughter] Mr Thomas Cole, who is the superintendent of all the mining companies which represent Mr Carnegie's interests in the United States Steel Company (who have charge of a vast proportion of the independent companies), said to me some months ago that we have just begun to scratch the surface. I am absolutely satisfied that in that country within the next twenty years there will be measured up to an almost exact mathematical calculation, not only a billion and a half tons, but three billion, or possibly five billion more tons than that.

That is not the problem with us, however. I was very much interested in the last remark of Mr Carnegie, when he spoke of the inland waterways. I was very much interested in the way the President paid his compliment to the Inland Waterways Commission this morning. I believe from what he said that he thought it a very important organization, and that it was to be perpetuated. [Applause] In the long run, the great problem with us is going to be, and it is now, an engineering problem. It is an engineering proposition entirely. If you will notice the line that marks the Father of Waters—the Mississippi—on this map, you will find it runs almost to the very border or western edge of Lake Superior. The Government has paid sixty-odd million dollars to improve Superior, Huron, and the other Great Lakes; I think less than $70,000,000 have been invested there, and they have made out of it the greatest commercial waterway in the world—there is nothing like it. [Applause] Now, if that $70,000,000 will make out of that the greatest commercial waterway in the world, what would a few intelligent million dollars amount to? If Lake Michigan, from the southern shore, were to be canalized into the Mississippi, and if Lake Superior were canalized into the upper portion of the Mississippi, and the Mississippi improved, we should be given the power of distribution; and with us that is after all the great problem.

It seems there are two problems here, not only the conservation of the resources, but the development of the industries. One is just as important as the other. [Applause] I do not believe the American people want to lock up these iron mines. I do not think they want to lock up the industries of the Middle West, or of all the country. I think what they want is the true scientific development of all of them; and the future will come pretty near taking care of itself.

With that suggestion, I am going to do what I got up here to do at the outset. I am going to ask the Conference to listen to Dr Van Hise, the President of the Association of Universities, who was connected for many years with the Geological Survey, and has had probably as much to do with the iron of the country, practically, as any other man here.

The PRESIDING OFFICER (Governor NOEL): Gentlemen, you have heard the suggestion of Governor Johnson. Is there any objection to hearing Dr Van Hise? The Chair hears none.

ADDRESS BY CHARLES RICHARD VAN HISE

PRESIDENT OF THE UNIVERSITY OF WISCONSIN

Mr Chairman, Governors, Gentlemen:

In considering the iron ore supply of the United States, I find myself in a position somewhat intermediate between that taken by Mr Carnegie and that of Governor Johnson.

According to Dr C. K. Leith, the known iron ore supply of the Lake Superior region is about 2,000,000,000 tons, bearing 50% or more metalic iron. According to Dr E. C. Eckel, the known iron ores of the Southern Appalachians reach 2,800,000,000 tons, bearing 33% to 50% metallic iron; averaging, however, nearer the lower than the higher percentage. Taking into account the difference in metalic content, the amount of iron in the known high grade ores is about the same in each of the two regions. While these two regions contain the great known supply of iron ore in the United States, the known deposits of the Central and Eastern States are not unimportant. Also the known deposits of the Western States are large, although not to be compared with those of the Lake Superior region or the South.

While the amount of iron ore which has been mined in the United States has been rapidly increasing during the past twenty-five years, rising in 1883 from 9,400,000 tons to over 58,000,000 tons for 1907, the discovery of new deposits has gone on at even a more rapid rate, so that it is certain for the Lake Superior and the Southern Appalachian regions, together as well as separately, more iron ore is now known to exist than at any previous time in the history of the country. If the grade of what is called "iron ore" for the Lake Superior region should be dropped from 50% to 40%—and some material is already mined which runs between these figures—the amount of ore would be enormously increased. But no quantitative statement can be made at the present time in reference to additions which would be thus available. Also in the Southern Appalachians, Eckel estimates that the probable amount of iron ore which will become known in the future by deep mining (that is, below the thousand-foot level), especially if the percentage of metallic iron be somewhat lowered, will greatly exceed the present known deposits; indeed, he suggests that future development along this line may amount to three times as much as the present estimated supply, or 8,400,000,000 tons. This forecast may be too sanguine, and it is admittedly more or less conjectural. However, it can hardly be doubted that the quantity of iron ore to become known in the future in the South is large.

In considering the material available to the United States we should take account of the supplies in adjacent countries. Mexico is as yet very imperfectly explored. In Canada there are vast areas of wholly unexplored territory. In Cuba examinations made by Spencer show that the known deposits of iron ore of fair metallic content are very large, and some of the more extensive of these deposits are already controlled by United States capital. Of the South American iron ore resources, we are as yet very imperfectly informed.

While the additions to the known supplies of iron ore available to the United States, which are to be made by discoveries in western United States, in Canada, in Mexico, in Cuba, and in South America, are uncertain, it is hardly possible that the amount will be unimportant; but as yet there is no reason to suppose that discoveries in any of these countries, with the possible exception of Cuba, will reveal iron ore deposits comparable in importance to the Lake Superior and the Southern Appalachian regions.

From the foregoing facts it appears probable that for some years to come, iron ore available in the United States will continue to be discovered more rapidly than it is exploited; and consequently the known total will increase rather than decrease. Hence the crest for known iron ore of high grade may be some years in the future.

It thus appears that with reference to the iron ore which may be available for the United States, we have to consider both the known or discovered supply and the unknown supply which may in the future be discovered. Governor Johnson has suggested that for Minnesota, the latter may be much larger than the former. It appears to me rather probable, both for that State and for the country as a whole, that the high-grade ores which are yet to be discovered will not exceed in magnitude those which have been discovered, and they may fall far short of them. Even if it be assumed that the high grade iron ore, containing 50% or more of metallic iron, remaining to be discovered is as great as the amount which is now known, allowing for a moderate increase of production, iron ore of this class would scarcely last for a century. If, however, what is called "ore" be defined to include all material above 35%, the available material will last for a considerable longer period than a century, possibly several centuries, even if the rate of production increase somewhat rapidly.

But in this connection it is to be remembered that as the percentage of metal in the ore goes down, a larger amount of coal is required to obtain a ton of iron, and therefore that in proportion as our rich ores are exhausted, the draft will become steadily heavier upon that most important of the underground resources—fuel.

Turning now to another metal, copper: So far as I know, there has been no systematic attempt to estimate the known supply of ore. The copper product of the United States, as well as that of the world, steadily increased for many years until 1906, when maxima of 444,000 tons as the output of the United States, and about 790,000 tons for the world, were reached. The United States product for the year 1907 decreased by 51,656 tons; whether this great check was temporary is uncertain, but it suggests that if we have not already reached the crest of production for copper we are nearing it.

The rapid annual increase in the output of copper for the past dozen years has only been accomplished by the exploitation of increasingly lower grade ores in at least two of the most important districts—those of Lake Superior and Montana. With copper as with iron, it is to be remembered that as the grade of ore goes down, it will ultimately cost more to produce a pound of metal, and therefore that as the grade of ore decreases the price of the copper must finally rise—although this result has been deferred by great improvement in mining and extraction, combined with handling the ore on a great scale.

For lead and zinc, gold and silver, it is not possible to make definite statements as to known ore supplies. These metals are usually developed in the mines only to a limited degree in advance of their exploitation. Therefore there never has been at any time many years supply of the ores of lead and zinc, of gold and silver, in sight. There are no great known bodies of these metals in the sense that deposits are known of iron ore. However, exploration and exploitation have gone on together, with the result that there has been a steadily increasing output of these metals both for the United States and for the world. Indeed, the increase for the last twenty-five years has been remarkable. The percentages of increase for 1907 as compared with 1883, twenty-five years previously, are as follows:

For lead	150 %
For zinc	537 %
For gold	62.9 %
For silver	21.8 %

Apparently the maximum output for none of these metals has been reached, with the exception of silver, which for the United States has been nearly horizontal for about fifteen years, and for the world has somewhat declined for the last half-dozen years, as compared with the previous period of the same length. How long we may expect an increase in the output of lead, zinc, and gold is uncertain, but, as in the case of copper, it may be said that the maintaining of an increasing output in the United States and for the world has been made possible only by utilization of lower grade ores.

It is a conservative statement to make that, during the last half century, there has been taken from the earth more of our metallic wealth than during all the previous history of its exploitation. For some of the metals we may illustrate the marvelous increase since 1850.

From 1810 to 1853 the amount of iron ore exploited in the United States is estimated at 5,000,000 tons; and from 1854 to 1907 at more than 700,000,000 tons. The pig-iron product of the world from the year 1500 to 1850 (350 years) is estimated at about 125,000,000 tons; and from 1850 to 1906 (56 years) at 1,113,000,000 tons, or about nine times as great.

The amount of copper which was taken out before 1850 in the United States is inconsiderable, but in 1906 it reached 58% of the world's production. For the first half of the nineteenth century the copper production of the world was 913,168 tons, and for the second half 9,717,000 tons, or more than ten times as much.

The gold production of the world from 1493 to 1850 (358 years) is estimated at 152,779,050 ounces troy, and from 1851 to 1907 at 450,075,135 ounces, or about three times as much.

The increase in the amount of silver mined was not so great as for gold. The estimated silver product from 1493 to 1850 (358 years) is 4,816,939,012 ounces troy, and from 1851 to 1907 (58 years) 5,166,804,675 ounces.

The above figures illustrate the point that the exploitation of the base metals, iron, copper, lead, and zinc, was relatively unimportant until the middle of the last century, whereas the amounts of the noble metals exploited before 1850 were important. So far as the progress of the world is concerned, there is no question that the base metals are of immeasurably greater consequence than the noble metals.

Statements similar to those concerning the base metals may be made even more emphatically in reference to coal. Illustrative of this in the United States, the coal production of the year 1856 was 12,293,000 tons, whereas for 1907 it was about 429,000,000 tons, or more than thirty-three times as great. Similar, although perhaps not so striking figures might be given for other countries, so that it is safe to say that the amount of coal exploited in the last half-century for the world is several times as great as the amount mined during all previous time.

The above statistics show that during the last half-century our metallic resources and coal have been drawn upon at a rate which has never before been dreamed of. This revolution has been largely due to the rise of applied science and its application to machinery and transportation.

If instead of the last half-century the last quarter-century only were considered, the enormous drafts upon our metallic resources would seem even more startling. During this period the total value of the annual metallic and nonmetallic, or roughly, the mine products of the United States has increased from about $447,000,000 to over $2,000,000,000, or more than four times.

Since the great acceleration in the exploitation of our metallic resources has occurred so recently, the yard-stick with which we are to project into the future is very short. We do not know whether the acceleration of exploitation of the past few years will be continued at the same rate, though it seems rather probable that the time is near at hand when the rate of acceleration will lessen; but whatever we may conclude in reference to this matter, we can not doubt that for many years to come the amount of metals extracted for any one decade will exceed that of the previous decade, that is, that the acceleration will proceed at some rate. Also it has been seen that while an approximate estimate can be made of the known resources, not even an approximate estimate can be made of the deposits yet to be developed or discovered in unexplored territory. Hence it is not possible to make any definite forecasts as to the time when the ores of any given metal will be exhausted.

On the whole the foregoing very brief review of the situation does not warrant such extremely pessimistic views as have sometimes been stated in reference to our supply of iron, lead, copper, zinc, gold, and silver. It is probable that we of this generation shall not see any great shortage of these metals. The same may be true for the next generation, but even the most sanguine calculations can not hold out the hope that the available high-grade ores of iron, copper, lead, zinc, gold, and silver, at the present rate of exploitation, will last for many centuries into the future. And what are one or even several centuries compared with the expected future life of the Nation?

But it may be said that when the metallic ores are mined and reduced, the metals are but put into a more available form; in short, that they are capitalized. This is true in large measure for all the metals. It may be very well illustrated by the world supply of gold now in the treasuries of banks and circulating among the people, estimated at about $7,000,000,000. However, it is plain that with the baser metals, lead, zinc, copper, and iron, we are very careless in preserving the existing accumulation. These materials are so handled that the yearly losses are very great. By care and economy the losses could be immensely reduced, and thus our capital of metals could be kept in a relatively unimpaired condition.

Certain it is that it took the building of the world, involving concentration and reconcentration of the metals in order to produce the ore deposits. The process of their formation is so slow that so far as we are concerned it may be ignored as a basis for new supply. We and our descendants are in the position of a man who has in the bank a definite amount of money upon which he may draw during his lifetime. He may be more or less ignorant of the amount which is available in the bank, as we are ignorant of the amount of metallic ores available in the bank of the earth. It is therefore obviously our duty in exploiting the metallic ores to do this in such a fashion that the lower grades not now available because of market conditions may in the future be exploited. Also it is plainly our duty to use metals which have been mined and reduced so that the yearly loss shall be small as possible. In short we should keep the capital as nearly unimpaired as practicable. These two duties are clearly before this generation. If they are disregarded, our descendants will charge us with wanton extravagance. We shall be in the position of a father who has wasted his patrimony and left a diminished estate to his son.

Of our mineral resources, the deposits of coal are by all odds of the greatest consequence. Next to coal is iron. For the United States the market values of these two products of the earth greatly exceed that of all other mine products, and are second only to the soil among our natural resources. Fortunately in this land our coal supply comprises three classes—lignite, bituminous, and anthracite; and each is vast in amount. In having an enormous quantity of anthracite, this Nation has a unique position; but the deposits of this class are confined to one small area in Pennsylvania. Anthracite is so superior to bituminous coal and to lignite for domestic purposes, and especially for heating houses, that it has a great advantage in competition with them.

According to Frank Julian Ware,[a] "Eight important railway systems now exercise an absolute monopoly over hard-coal mining. * * * Together they own more than nine-tenths of the entire anthracite deposits of Pennsylvania, and about three-fourths of the total production is mined by their subsidiary coal companies." With reference to the control of iron ores in the United States, the Steel Corporation has a dominating position. Of the known iron ore deposits of high grade in the United States, it is estimated that the United States Steel Corporation owns 80% (and some estimates are even higher). Thus a few corporations are in a position approaching monopoly with reference to two of the most fundamental resources of the Nation.

It took millions of years of labor of sun and earth to manufacture these great natural sources of wealth. They are the inalienable heritage of our People, and not of a chosen few. Under our laws we have largely entrusted them to the care of great corporations. These corporations must so administer their trust that the people shall possess their heritage. By this I do not mean to suggest that the corporations now controlling these properties should be wronged, but they should understand that they are in the position of trustees with reference to these great sources of wealth; and that if they do not willingly administer them fairly and to the advantage of the People, the Nation and the States not only ought to but will prescribe all regulations necessary to accomplish this.

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[a] The Outlook, February 15, 1908, p. 357.

The **Presiding Officer** (Governor **Noel**): Gentlemen, I suggest that the Committee on Resolutions report in the morning on a temporary form of organization and order of business. If there is no objection, we will just consider that instruction passed over to the Committee.

Governor **Blanchard**: Mr President, I would like to give notice right now, following your suggestion, that the Committee on Resolutions will hold a meeting immediately after the adjournment of the Conference this afternoon. The Committee on Resolutions, besides myself, consists of the following Governors: Fort, of New Jersey; Cutler, of Utah; Davidson, of Wisconsin; and Ansel, of South Carolina. Those gentlemen will please meet me immediately following the adjournment this afternoon for a brief conference over in the corner of this room.

I would further ask, while I am on my feet, Mr President, that the Committee on Resolutions have the permission of the Conference to sit during the sessions of the Conference.

The **Presiding Officer**: You have heard the remarks of the Governor of Louisiana. If there is no objection, the course suggested by him will be followed. The Committee will meet as requested, and it will have the privilege of holding its sessions during the Conference, and will also be charged with the duty of suggesting to us in the morning a form of organization and order of business. If there is no objection to that course, it will all be taken.

Governor **Blanchard**: Is that form of organization of which you speak for the present Conference?

The **Presiding Officer**: Yes; for the present Conference.

Governor **Folk**: Have we not a regular order of business printed?

The **Presiding Officer**: We are going to follow the program, but the program is exhausted, and we are on an order of business, with no order, now.

Governor **Blanchard**: I am, just at the moment at least, at a loss to know what kind of a form of organization it is expected the Committee on Resolutions will report, for the management, so to speak, of the Conference, tomorrow. As suggested by the Governor of Missouri, there is a printed calendar to follow, and we are following it this afternoon. There are papers to be read by gentlemen to whom that task has been assigned, to be followed by general discussion, such as that which is taking place now. The President of the United States is President of this Conference, and he has named yourself to preside over it this afternoon in his absence. Tomorrow he has named to preside over it in his absence the Governor of Minnesota. It seems to me, with all due deference to the Chair, that we have enough of organization at present. [Laughter]

The **Presiding Officer**: The Governor of Louisiana is trying to throw on me and off of himself some of the troubles that now confront us.

Governor **Folk**: This matter can be settled, Mr President. We have an organization in so far as the Presiding Officer is concerned. The President having called this Conference, he is the Presiding Officer, and you are now acting for him. He has requested some gentlemen to act as secretaries in taking down the minutes. I think, however, we should have at least an Honorary Secretary from among the Governors. I therefore nominate Governor Burke of North Dakota.

The **Presiding Officer**: It is moved and seconded that Governor Burke of North Dakota be nominated for Honorary Secretary.

Governor **Blanchard**: I second that motion.

The **Presiding Officer**: Is there any other nomination? If not, the nominations will be closed.

The question upon agreeing to the motion was put to the Conference, and it was agreed to.

The **Presiding Officer**: With regard to the question of program, which I brought up a moment ago; a program is arranged, but not in all its details. We have the times of meeting. We have the leading subjects of discussion. They have all been arranged, and admirably arranged; but then when this discussion is over, as it is over now, so far as the program is concerned, it has been suggested that the next order would be that the Governors would be called on for remarks, then the members of the Conference, the Members of Congress, the members of the Cabinet, and others who are included in the call, and then afterward their associates or the representatives of the special interests. We ought to have something definite along that line.

Governor **Blanchard**: I would suggest to the Chair that the calendar which he holds in his hand contemplates that after the prepared papers have been read and general discussion follows, not only the Governors but other gentlemen invited to this Conference can participate in such discussion.

The **Presiding Officer**: It is with regard to the order for discussion, Governor, that I am now considering it. It is not as to who can discuss, but who is to discuss first, and how it shall be presented. That is one of the problems.

Governor **Blanchard**: I have no doubt there are gentlemen now before you, within hearing of the sound of my voice, who are anxious to continue the discussion so admirably begun by the Governor of Minnesota.

The **Presiding Officer**: Very well; I will follow out the suggestion. It will be easier to make an order of business than it will be to manufacture one through the Governor of Louisiana, who is so opposed to it. [Laughter] The weather is warm, and no doubt he wants rest.

It has been suggested that the next discussion will be from the members of the Conference, strictly so-called, who are the Governors, the Members of the Cabinet, the Justices of the Supreme Court, and the Representatives and Senators.

Governor FOLK: Mr President, who else could discuss it here?

The PRESIDING OFFICER: The associates could discuss it. The representatives and specialists on various lines could discuss it.

Governor FOLK: Did you mean to exclude from discussion those invited by the Governors?

The PRESIDING OFFICER: Oh, no; but we want to arrange the order.

Governor JOHNSON: In the absence of any formal organization, let us make it an indiscriminate fight, and let everyone in the room talk just exactly as he pleases.

Mr SNYDER: Mr President, I move that we adjourn at 5 oclock, and that addresses be limited to five minutes.

The motion was seconded.

The PRESIDING OFFICER: That cannot be put all at once. The first question is, shall discussion be limited to five minutes; during this afternoon ten minutes has been the regular order. Are there any remarks? The question is upon agreeing to the limitation to five minutes.

The question was put upon agreeing to the motion, and it was not agreed to.

The PRESIDING OFFICER: We will not consider the motion to adjourn. That is a separate proposition just now. We will consider that when the order is presented. The meeting is open for all discussion. All present are members, the press included. There has been no limitation; but, Governor, I suggest you do really prepare some order. [Laughter]

Governor BLANCHARD: Mr President, I will relieve the anxiety of the distinguished Governor of Mississippi by assuring him that the Committee on Resolutions will report an order of business.

The PRESIDING OFFICER: Yes; we need one; not to displace anything that has already been arranged, but in amplification of it.

Mr GOUDY: At the request of the Sixteenth National Irrigation Congress, I desire to announce that there will be a meeting of the Executive Committee of that body in the parlors of the Hotel Raleigh tomorrow morning at 9 oclock, and as there are matters of importance to come up I hope all the members who are present here will attend.

The PRESIDING OFFICER: It has been suggested that resolutions can be handed directly to the Committee on Resolutions. If there is no objection, that suggestion will be considered as adopted. In that event, you can give the title of the resolution to the Secretary and hand it in tomorrow morning, and in that way it will appear on the journal. The resolutions will be considered as having been offered today and referred without discussion. Are there any remarks now from any source?

Mr Barrett: Mr President, I move that Governor Hughes of New York be invited to address the Conference. [Applause]

Mr Sherman: Governor Hughes of New York has been compelled to leave the city to return to Albany.

The Presiding Officer: We very much regret it.

Mr John Hays Hammond, President of the American Institute of Mining Engineers, is recognized.

Address by John Hays Hammond

Mr. President and Gentlemen:

It has unfortunately become the popular custom to speak of the natural resources of our Country as illimitable, and consequently to regard the discussion of the conservation of these resources as academic, or at the best as scientific speculation. All efforts heretofore of a few enthusiastic theorists—as they were considered—have availed naught to disturb this imperturbable complacency and optimism. Today, however, at the eleventh hour, thanks to the persistency of these same far-sighted, public-spirited, and eminently practical men—as they are now regarded—we realize for the first time the gravity of the situation. We see, at last, that this is not a subject affecting future generations only, but that it is one of vital and immediate concern to ourselves and to our children. We see, too, that it is not a question confined to particular localities, or to special classes in the community, but that it is one of transcendent interest to every inhabitant of this land.

Furthermore, we see that the greatness of our Nation, based as it is upon its industrial, its commercial, and its financial supremacy, depends absolutely on the conservation of its natural resources; and we recognize therefore, the fact that the spirit of patriotism, as well as that of enlightened self-interest, demands our hearty cooperation in this great work.

In connection with our efforts to prevent the waste of our natural resources, there is no more promising field than in the conservation of our natural gas and of our coal deposits.

Dr White estimates the waste of natural gas, (which is, as he says, "the purest form of fuel, ideal in every respect") at a billion cubic feet daily, equivalent to a heating value of a million bushels of coal. This is, as he rightly remarks, "an appalling record to transmit to posterity."

There is considerable waste, too, in connection with the mining of coal, but this waste is partly unavoidable, and perhaps does not exceed 50% of the quantity of coal mined throughout the country. This is large but it is less than the loss due to the inefficiency of our present methods of converting this coal into power.

As Mr Carnegie has pointed out, not more than from 5% to 10% of the potential energy of the coal mined is actually used. Indeed, in the ordinary electric-light plants, hardly one-fifth of one percent of the energy of the coal is actually transformed into electric light. It is in these directions that we must make special efforts for improvement. Indeed, a considerable progress has already been made through the development of gas-producers, internal-combustion engines, and steam turbines; and, as Mr Carnegie says, "We are not without hope of discoveries that may yet enable man to convert potential into mechanical energy direct, avoiding this fearful waste." In the meantime, our policy should be to exploit the water-powers that are now being wasted, with the view of conserving as far as possible, our coal supplies, until we shall have attained greater efficiency in the utilization of this coal for the development of power.

In connection with the exploitation and utilization of the mineral resources of the country, other than in coal and iron, there has been a smaller amount of preventable waste. It is, of course, true that there are losses in the mining and reduction of the ores of gold, silver, copper, lead, etc; but while our methods are susceptible of improvement, there is no way of revolutionizing them; and especially is this the case in many of the metallurgical processes, where the irreducible minimum is not great.

In common with every other national industry, that of mining is vitally concerned in the conservation of our natural resources. The present discussions show conclusively the interdependence of these industries. For example, the exploitation of our mines depends chiefly upon the costs of labor, power, and supplies, and these costs are largely determined by the economies attending the development of our other natural resources. Therefore, on the economies effected in these industries depend, reciprocally, the cost of our mineral products; and, obviously, the lower the costs of mining, the greater the available tonnage that can be profitably extracted. Indeed, in many of our low-grade mines, so-called, the margin between profit and loss is so small that any appreciable increase in the cost of mining involves pecuniary loss, and the consequent cessation of operations. Furthermore, the mines of this character are those from which the major part of our production is derived.

What has been said of the danger of rapid depletion of the iron and coal deposits is applicable, *mutatis mutandis*, to the other mineral deposits of the country. Large deposits of ore are often referred to as inexhaustible. Such hyperbole characterizes the descriptions of the famous gold deposits of the Traansval, when, as a matter of fact, experts know that even these exceptionally extensive deposits will be practically exhausted within two decades—certainly within a generation. The ever-increasing rapidity of exploitation consequent on the exigencies of modern engineering and economic practice, inevitably tends to an alarming diminution of the life of our mineral deposits. The culmination of our mining industry is to be reckoned by decades, and its declension, if not practically its economic exhaustion, in generations—not in centuries.

While it is undoubtedly the fact that a very considerable lowering in the working costs, or a correspondingly enhanced value of the mineral products, would prolong the activity of the mining industry, yet the statement I have made, predicated as it is on the known mineral deposits only, may be regarded as conservative. New ore fields will undoubtedly be found, as the result of future explorations; but the discovery of the more important deposits will, in all probability, occur in the comparatively near future.

Fortunately, a compensation for the economic effect of the losses of metal attending the present methods of mining and of ore reduction, may be found in the fact that the metals saved are utilized without being, like coal, entirely and irrevocably destroyed in use. Gold and silver mainly serve to increase the stock of the precious metals upon which the monetary systems of the world are based. The dissipation of gold and silver, beyond recovery, by actual abrasion of coins would be much greater than it is but for the general employment of paper currency, bank checks, etc., superseding the actual passage of coins from hand to hand. Every practicable and safe increase in that direction is a distinct and important saving of the world's resources—even more important in Great Britain than elsewhere, by reason of the greater softness of the alloy used for British gold coins. Aside from this source, the regular consumption of gold in the arts is probably not to be avoided or reduced.

The use of iron, copper, lead, et al. is similarly divisible into two classes, of which one leaves for further use more or less scrap metal or waste from which metal can be recovered, while the other destroys or dissipates beyond recovery the metal employed. An interesting illustration of the latter kind is furnished by the destruction of copper, etc, through the wearing out of bearings on railroads and in machinery generally. This has been estimated for railroads alone, I believe, at not less than 5% of the annual product of copper. It would be a most useful step towards the conservation of metallic resources to ascertain for each metal the amount of its annual unavoidable destruction.

The PRESIDING OFFICER (Governor NOEL): There has been a call for an address by the Governor of Missouri, Governor Folk. The Governor has told me privately that Dr Black could better explain the conservation of mineral resources of Missouri than he could, and has asked that he be called as his substitute. If there is no objection, we will hear Dr Black.

Dr **Black**: Mr President, I am very sorry that I can not speak with authority on the subject of mines; for we have mines in Missouri, and very important ones. The subject that I am specially interested in, however, is the subject of water transportation and forestry. I can not help but notice, in comparing the two maps that are before us, that there are great mines in Missouri which could supply a large part of our population, while Missouri River is made so very small on the map that it would be almost impossible, until something is done, to transport the valuable coal and other minerals that are on that line to the markets at proper values.

The **Presiding Officer**: Who shall we hear next? [Cries of "Root," "Root"]

Secretary Root is called for, and has the floor.

Address by Honorable Elihu Root

SECRETARY OF STATE

Mr President, Governors, Gentlemen:

What occurs to me today, in response to your very kind call upon me, is what comes naturally to the mind of the officer who is the official medium of communication between the Government of the United States and the Governments of the States.

Forty-four sovereign States are represented here, I see by the newspapers; all sovereigns here on the invitation of the Executive of the sovereign Nation, the United States. No one can over-estimate the importance of maintaining each and every one of the sovereignties of the States, [applause] and no one can over-estimate the importance of maintaining the sovereignty of the Nation.

The Nation cannot perform the functions of the State sovereignties. If it were to undertake to perform those functions it would break down. The machinery would not be able to perform the duty. The pressure is already very heavy upon national machinery to do its present work.

I feel deeply impressed, however, with the idea that the forty-six sovereign States, in the performance of their duties of government, are lagging behind the stage of development which the other sovereignties of the earth have reached. As the population of our States increases; as the relations between the People of each State and other States grow more frequent, more complicated, more important, more intricate, what every State does becomes more important to the People of every other State. [Applause]

If you look at the international life of the world, you will see that the correspondence between the Nations is continually increasing, not in the letter-writing sense, but in the intercommunication and understanding about the things that they should do in concert for the benefit of all their people.

Scores and hundreds of conferences and congresses are being held under Government auspices to regulate the action of the different Nations of the earth. England and France and Germany and Spain, indeed all the Nations of Europe, are considering the conduct of their Governments with reference to the effect which their action will have upon the People of each other country.

Now the States, in the exercise of their sovereignty, in the exercise of the powers reserved to them, rest under the same kind of duty, [Applause] a duty that forbids any State to live unto itself alone. [Applause]

The Constitution of the United States prohibits the States from making any agreement with each other without the consent of Congress; but you can make any number of agreements with the consent of Congress. Why should not the powers that are reserved to the State sovereignties be exercised by those sovereignties, with a wise regard for the common interest, upon conference, upon complete understanding of the duties of good neighborhood, under a firm resolve to make it wholly unnecessary that this continual pressure to force the National Government into the performance of the duties that the States ought to perform should continue? [Applause]

It is high time that the sovereign States of the Union should begin to perform their duties with reference not only to their own local individual interests, but with reference to the common good. [Applause]

I regard this meeting as marking a new departure, the beginning of an era in which the States of the Union will exercise their reserved sovereign powers upon a higher plane of patriotism and love of country than has ever existed before. [Great applause]

[Cries of "Cortelyou," "Cortelyou"]

The PRESIDING OFFICER (Governor NOEL): Secretary Cortelyou is called for, and has the floor.

ADDRESS BY HONORABLE GEORGE B. CORTELYOU

SECRETARY OF THE TREASURY

Mr President and Gentlemen:

It is a distinguished honor to be asked to speak for even a few moments before such a gathering as this, and to speak from the same platform as Elihu Root. [Applause]

At first I wondered at just what point the Treasury Department touched this question of the conservation of our natural resources, but as I have listened to your discussions during the day I realized that we touch it very intimately at many points. I was particularly struck by some of the remarks made by two or three speakers this afternoon, and especially by the remarks of Mr Hammond as to our gold and silver production, or rather the gold and silver production of the world.

I merely mention that as one indication of the fact that at the beginning of such conference as this there may be many who will be in doubt as to just what their relation may be to the Conference; but as it develops I think we shall realize that not alone every Department of the National Government but every State and every Citizen is deeply concerned with the vital question that is the subject of your meeting here. [Applause]

There is one other reflection that comes to me, and to which I have taken occasion frequently to refer at meetings, international gatherings, and important conventions—and that is that not alone the great questions that may be discussed are important, but that in the bringing together of men from different sections of the country, and in this instance the Governors of our States, where they touch elbows, interchange views, and come to understand better the needs of these different sections, we achieve a result oftentimes as great as, sometimes even greater than, the result of the discussions of the important questions more immediately involved in the Conference.

To presume for just one further moment, and as supplementing what the Secretary of State has said, let me say that in such a meeting as this we are bound to think, if we do not at all times give expression to the thought, of the relations of the National Government and the Governments of the States; but this question will disturb us much or little just in proportion as each State shall realize and live up to its responsibilities as an indestructible part of an indestructible Nation. [Applause]

[Repeated calls for "Ransdell"]

The PRESIDING OFFICER (Governor NOEL): Representative Ransdell of Louisiana is called for.

Mr RANSDELL: Mr President, I have no knowledge at all of the subject under discussion this afternoon.

The **Presiding Officer**: You are a water man.

Mr **Ransdell**: Yes; and I would much prefer to say something later on. I notice that the subject of waterways comes up later on during the discussion, and at that time I shall have a few words to say.

Mr **Bryan**: Mr President, I would suggest that, according to the map, Pennsylvania, Ohio, West Virginia, and Illinois are largely interested in the coal mines; I think it would be well, before we adjourn, to hear from the Governors of these States, and I would commence with Governor Dawson of West Virginia.

The **Presiding Officer**: Will Governor Dawson take the platform?

ADDRESS BY W. M. O. DAWSON

GOVERNOR OF WEST VIRGINIA

Mr President and Fellow Governors:

We think that West Virginia is a pretty rich State in natural resources. If you took a vote out in West Virginia, they would vote that she is the richest State in the Union, and therefore we are very greatly concerned in this whole question of the conservation of these resources. We are especially rich in coal, natural gas—I mean the kind that comes from the ground [laughter]—and oil.

You have heard something about the waste of these mineral resources. You have had the great benefit, allow me to say, to listen to the very able paper of Dr White, the State Geologist of West Virginia, whose reputation upon these subjects is not only national but international.

As the great Secretary of State has said to you, we are all one family, and no State liveth unto itself. If you are wasting things in Missouri, you are wasting part of the common heritage of this whole country, and we people who live in West Virginia, as a part of this common country, are therefore interested that you stop that waste. [Applause] And if we are doing those things in West Virginia, all of you in all of the States are interested that we should stop doing those bad things; and, as I understand, we are here to learn how to stop doing them.

We have heard a great deal about the waste of our resources, and about how soon our coal and oil and gas will be exhausted; and although this is a very warm day I begin to shiver a little myself in anticipation of that prolonged cold spell which is going to strike us about a hundred years from now. [Laughter]

Now, while I do not undertake, Gentlemen, to say that we have heard enough about the waste, I want to respectfully suggest Mr President, with your permission, that it is about time we should hear something about how to stop it, how to apply the remedy.

I brought with me, according to the invitation of the President, three gentlemen to assist me. What a wise President we have, and how nice he was about that! He knew that some of us did not know much about this subject—I do not anyhow—and he gave us the privilege of bringing somebody here with us who did know. I am glad he did. And I have a gentleman with me, who knows a great deal about this, and I would like to have him address the conference.

Mr OSBORN (of Michigan): Mr President——

The PRESIDING OFFICER: For what purpose does the gentleman rise?

Mr OSBORN: I thought the Speaker was through. I simply want to make a suggestion.

The PRESIDING OFFICER: I do not know that he is through yet. Are you through, Governor?

Governor DAWSON: No, sir; I am not through yet.

Mr OSBORN: There is in our midst a very distinguished man, whose name you will be proud to hear.

Governor DAWSON: I was going to mention a distinguished man myself. [Laughter] I find this country is full of distinguished men. Dr White was stolen from me, but I brought with me another gentleman, the Chief Mine Inspector of West Virginia. There is nobody in this country who knows any more about coal and how best to mine it than Mr Paul. I would like to have you hear from Mr Paul, in my place, on how to conserve the waste in coal.

The PRESIDING OFFICER: We will hear from some of the Governors.

Mr OSBORN: Mr President, I do not understand, or claim to understand, the standing of a delegate here who is not a Governor; but I want to mention the name of a man I love, and you love, and every man here loves, one who has taught Governors, whom Governors are glad to honor, who taught John Hay, who taught Richard Olney, who is the President of Michigan University, and who is approaching 80 years of age—Dr Angell. He classes with the best of all, the flower of the nation.

The PRESIDING OFFICER: Dr Angell is called for.

ADDRESS BY DR J. B. ANGELL

PRESIDENT UNIVERSITY OF MICHIGAN

If there is any occasion in connection with which I am not permitted to offer anything of service I think this may be the one. I can do little more than express my great pleasure in meeting so many of our distinguished citizens from all parts of the country, and to express my extreme gratification that the time has come when the various States of the Union, in accordance with the suggestion of the Secretary of State, are prepared in such harmonious spirit to take up any great object of common interest, and to come here to discuss it with sincere desire, not alone to increase the prosperity of each of the States, but to increase the prosperity of the whole Nation in a spirit of common regard for the interest of all. [Applause]

I think we may say that in the whole history of our country, so far as I can recall, there has never been an assemblage, since the one that was first gathered to frame the Constitution of the United States, where so great interests were apparently considered with such a lofty patriotic spirit as seems to be manifested here today. I am sure that this will stand upon record as a great historic event, and that you, and your children, will all be proud that you have been able to participate in it.

I beg to thank you for the opportunity of looking you in the face.

Governor HOCH: Mr President, I think this is about as good a time as any to settle one proposition. The President has invited the Governors of the various States to this Conference, and has invited those Governors to invite three representative citizens for their respective States.

Speaking for myself—and I believe voicing the sentiment of all the Governors who hear me—so far as I am concerned I wish to be placed on an absolute equality with all the representatives of all the States with whom we have come here to consider these matters; that the Governors shall have no preference in the matter of discussion; that these representative citizens who have accompanied us shall be on an absolute equality during these three days of discussion, and that they shall be heard quite as freely as we shall be heard. Governors, does that meet with your approval?

The PRESIDING OFFICER (Governor NOEL): The associates of the Governors are not the only ones who are here. There are the Cabinet, the Supreme Court, and the Senators and Representatives; but the privilege of the floor is a matter to be regulated by the Committee.

Governor BLANCHARD: Mr President, I must differ from the Chair in that respect.

The PRESIDING OFFICER: What is it, Governor?

Governor BLANCHARD: It is that without regard to the Committee on Resolutions, every delegate to this convention, whether he be a Governor or not, if he be here on the invitation of the President, is entitled to take part in these discussions with the same privileges that the Governors have. I fully agree with my friend from Kansas in what he has said, and it does not need the intervention of the Committee on Resolutions to give any delegate the right of recognition by the Chair.

Governor DAWSON: Mr President, I think this question ought to be settled. I brought three gentlemen with me who have the same invitation that I have. I understand that they can not speak as long as some Governor wants to talk. [Laughter]

Governor BLANCHARD: That is not correct. They may speak.

Governor DAWSON: That may be true, but I will answer you with the case of the fellow who was in jail. When his lawyer told him they could not put him there, he said: "Yes; but I am already here." I called upon a gentleman to speak in answer to a call that was made upon me, and I was told that he could not speak because there was some Governor wanted to speak.

The PRESIDING OFFICER: It was because West Virginia had already been heard from twice.

Governor SWANSON: Mr President, let me suggest this: The President has fixed a program for us; he is chairman of this meeting excepting when a deputy is acting for him. The power of recognition is with him or his deputy, after the completion of the program that the President has prepared for us. He has recommended to this Conference of Governors that they take charge of the meeting and determine what the action shall be. It seems that in courtesy to the President, in courtesy to his deputy, the proper course for us to pursue is to carry out his program; and after that program is completed it is for us, his invited guests, delegates and all, to determine whether this shall be a permanent body and what its resolutions shall be; but at this time it seems to me entirely out of place to arrange a program to determine who the President shall recognize tomorrow. So I believe in adhering to the program in which we were invited by the President to participate.

The PRESIDING OFFICER: The Governors, newspaper men, and all the rest look alike to me. They are all mixed. The President when he is here is in just the same position as one of us. I wanted to solve the difficulties that are up to the President when he is here, and up to his deputy when he is absent. The Governors have no badges; and there is no distinguishing mark on a Governor's associate—we do not know him from anybody else. If all who are here are to have the same privileges, let the Committee so determine, and let the Committee so report.

Governor BLANCHARD: On behalf of the Committee on Resolutions I offer this motion:

I move that those gentlemen indicated in the President's letters to the Governors, to be invited here by each Governor as his assistants, three in number, have the same privileges of recognition on the floor to discuss all questions arising at this Conference as the Governors and others invited directly by the President have.

The **Presiding Officer**: Shall we add a little further to it? Ought we not to include Senators who are here, because they were invited; and Representatives, and members of the Supreme Court, and members of the Cabinet who are here?

Mr **Osborn**: They were invited directly by the President.

The **Presiding Officer**: The motion embraces all those?

Governor **Blanchard**: My motion includes every one invited to this Conference by the President. I move therefore that every gentleman invited to this Conference by the President, or invited to this Conference by a Governor through the suggestion of the President, be accorded equal privileges on this floor.

Governor **Hoch**: I second the motion.

The question was taken on agreeing to the motion of Governor Blanchard, and it was agreed to without dissenting voice.

Governor **Hanly**: Mr President, I move the Conference do now adjourn.

The motion was seconded by several voices, and was put and agreed to; and the Conference accordingly, at 5:05 oclock, p. m., was declared adjourned until Thursday, May 14, at 10 oclock, a. m.

THIRD SESSION

The Third Session of the Conference was called to order in the East Room of the White House at 10 oclock a. m., on Thursday, May 14, 1908, by the President of the United States.

The PRESIDENT: I will ask Governor Johnson to occupy the platform with me until the time comes when I shall have to leave, when he will preside. I will ask that Governor Deneen preside this afternoon, after the session has been opened.

Mr Hill is to open the Conference this morning with an address on "The Natural Wealth of the Land and Its Conservation." [Applause]

THE NATURAL WEALTH OF THE LAND AND ITS CONSERVATION

JAMES J. HILL

Mr President and Gentlemen:

In some respects the occasion that calls together this assemblage is unprecedented. The dignity and public influence of those present mark its importance. It is in effect a directors' meeting of the great political and economic corporation known as the United States of America. The stockholders are the 87,000,000 People of this country; the directors are the State and Federal officers, whose position brings them in touch with the operation of the whole country. We should not fail to recognize the high note that has been struck and the immensity of the interests involved upon the lives of millions yet to be.

The two-fold significance of this meeting is found in the comparative novelty of its subject matter and of the method by which it has been approached. The subject is the conservation of our national wealth, and a careful study of our national economic resources.

Two years ago, in an address delivered before the meeting of the Minnesota State Agricultural Society in St. Paul, I reviewed the practical consequences and the statistical proof of that national wastefulness which competent scientific authority had already set down as distinguishing the American people. From data of the highest certainty, no, one of which has ever since been called in question, I then forecast some of the conditions certain to arise within the next half-century, when the population of this country will have grown to more than 200,000,000. The facts were pointed out not in the spirit of the alarmist, but in order that attention might be directed to the way by which the nation may escape future disaster. So rapidly do events move in our time, so swiftly do ideas spread and grasp the public mind, that some policy directed to the ends then set forth has already become a national care. It is this policy—the conservation of national resources, the best means of putting an end to the waste of the sources of wealth—which largely forms the subject-matter of this Conference. For the first time there is a formal national protest, under seal of the highest authority, against economic waste.

The method by which this end is to be reached is scarcely less interesting or significent. This body has no legal status, and its conclusions will not be of binding effect upon the Nation, the State or the citizen. Yet they will carry a weight greater than legislatures can impart, a force that even courts could not strengthen, because they will not be subject to repeal. [Laughter] They will represent a truly national opinion expressed with fidelity to our national constitutional form. The People of the United States are represented here through the several States. May we not hope that from this gathering there may be born not only a wiser system of using the still remaining resources of this country, but a cooperation between Nation and State that shall be as helpful in our political as these deliberations ought to be in our economic future?

"Of all the sinful wasters of man's inheritance on earth," said the late Professor Shaler, "and all are in this regard sinners, the very worst are the people of America." This is not a popular phrase, but a scientific judgment. It is borne out by facts. In the movement of modern times, which has made the world commercially a small place and has produced a solidarity of the race such as never before existed, we have come to the point where we must to a certain extent regard the natural resources of this planet as a common asset, compare them with demands now made and likely to be made upon them, and study their judicious use. Commerce, wherever untrammeled, is wiping out boundaries and substituting the world-relation of demand and supply for smaller systems of local economy. The changes of a single generation have brought the Nations of the Earth closer together than were the States of this Union at the close of the Civil War. If we fail to consider what we possess of wealth available for the uses of mankind, and to what extent we are wasting a national patrimony that can never be restored, we might be likened to the directors of a company who never examine a balance sheet.

The sum of resources is simple and fixed. From the sea, the mine, the forest and the soil must be gathered everything that can sustain the life of man. Upon the wealth that these supply must be conditioned forever, as far as we can see, not only his progress but his continued existence on earth. How stands the inventory of property for our own people? The resources of the sea furnish less than 5% of the food supply, and that is all. The forests of this country, the product of centuries of growth, are fast disappearing. The best estimates reckon our standing merchantable timber at less than 2,000,000,000,000 feet. Our annual cut is about 40,000,000,000 feet. The lumber cut rose from 18,000,000,000 feet in 1880 to 34,000,000,000 feet in 1905; that is, it nearly doubled in 25 years. We are now using annually 500 feet board measure of timber per capita, as against an average of 60 feet for all Europe. The New England supply is gone. The Northwest furnishes small growths that would have been rejected by the lumberman 30 years ago. The South has reached its maximum production and begins to decline. On the Pacific Coast only is there now any considerable body of merchantable standing timber. We are consuming yearly three or four times as much timber as forest growth restores. Our supply of some varieties will be practically exhausted in 10 or 12 years; in the case of others, without reforesting, the present century will see the end. When will we take up in a practical and intelligent way the restoration of our forests?

Turning now to one of the only two remaining sources of wealth, the mine, we find it different from the others in an important essential. It is incapable of restoration or recuperation. The mineral wealth stored in the earth can be used only once. When iron and coal are taken from the mine, they cannot be restored; and upon iron and coal our industrial civilization is built. When fuel and iron become scarce and high-priced, civilization, so far as we can now foresee, will suffer as man would suffer by the gradual withdrawal of the air he breathes.

The exhaustion of our coal supply is not in the indefinite future. The startling feature of our coal production is not so much the magnitude of the annual output as its rate of growth. For the decade ending in 1905 the total product was 2,832,402,746 tons, which is almost exactly one-half the total product previously mined in this country. For the year 1906 the output was 414,000,000 tons, an increase of 46% on the average annual yield of the 10 years preceding. In 1907 our production reached 470,000,000 tons. Fifty years ago the annual per capita production was a little more than one-quarter of a ton; it is now about five tons. It is but eight years since we took the place of Great Britain as the leading coal producing nation of the world, and already our product exceeds hers by over 43%, and is 37% of the known production of the world. Estimates of coal deposits still remaining must necessarily be somewhat vague, but they are approximately near the mark.

The iron industry tells a similar story. The total of iron ore mined in the United States doubles about once in seven years. It was less than 12,000,000 tons in 1893, over 24,000,000 tons in 1899, 47,740,000 tons in 1906 and over 52,000,000 tons in 1907. The rising place of iron in the world's life is the most impressive phenomenon of the last century. In 1850 the pig iron production of the United States amounted to 563,757 tons, or about 50 pounds per capita. Our production now is over 600 pounds per capita. We do not work a mine, build a house, weave a fabric, prepare a meal or cultivate an acre of ground under modern methods without the aid of iron. We turn out over 25,000,000 tons of pig iron every year, and the production for the first half of 1907 was at the rate of 27,000,000 tons. This is two and one-half times the product of Great Britain. It is nearly half the product of the whole world. And the supply of this most precious of all the metals is so far from inexhaustible that it seems as if iron and coal might be united in their disappearance from common life.

The large deposits of iron ore in this country are now located. For cheap iron we depend on the Lake Superior district, because of its high grade, the ease of extracting the ore from the mines, and its nearness to cheap transportation. At the rate of over 50,000,000 tons per year, our present consumption, it would require over 2,000,000,000 tons to supply the demand for the next 40 years, supposing it to remain stationary. This would approach the end of all the higher grade ore in large deposits now in sight in this country. The product of other workings would be of inferior quality and higher cost, and remote from market. But production is certain to increase even more rapidly than in the past. A few years ago a Swedish geologist prepared for his government a report which stated that the entire supply of the iron ore in the United States would be exhausted within the present century. The United States Geological Survey declared this an over-estimate; but here is the conclusion of its own report, after a careful examination of the question in the light of the best authorities. I quote the official published document:

> Assuming that the demand for iron ore during the present century may range from 50,000,000 to 100,000,000 tons per year, the Lake Superior district would last for from 25 to 50 years, if it supplied the entire United States. But counting on the known supply elsewhere in the United States, the ore will last for a much longer period, though, of course, it must necessarily show a gradual but steady increase in value and in cost of mining, along with an equally steady decrease in grade.

The most favorable view of the situation forces the conclusion that iron and coal will not be available for common use on anything like present terms before the end of this century; and our industrial, social and political life must be readjusted to meet the strains imposed by new conditions. Yet we forbid to our consumers access to the stores of other countries, while we boast of our increased exports, of that material for want of which one day the nation must be reduced to the last extremity. [Applause]

We now turn to the only remaining resource of man upon this earth, which is the soil itself. How are we caring for that, and what possibilities does it hold out to the People of future support? We are only beginning to feel the pressure upon the land. The whole interior of this continent, aggregating more than 500,000,000 acres, has been occupied by settlers within the last 50 years. What is there left for the next 50 years? Excluding arid and irrigable areas, the latter limited by nature, and barely enough of which could be made habitable in each year to furnish a farm for each immigrant family, the case stands as follows: In 1906 the total unappropriated public lands in the United States consisted of 792,000,000 acres. Of this area the divisions of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico and Wyoming contained 195,700,000 acres of surveyed and 509,000,000 acres of unsurveyed land. Little of Alaska is fitted for general agriculture, while practically all of the rest is semi-arid land, available only for grazing or irrigation. We have, subtracting these totals, 50,000,000 acres of surveyed and 36,500,000 acres of unsurveyed land as our actual remaining stock. And 21,000,000 acres were disposed of in 1907. How long will the remainder last? No longer can we say that "Uncle Sam has land enough to give us all a farm."

Equally threatening is the change in quality. There are two ways in which the productive power of the earth is lessened; first by erosion and the sweeping away of the fertile surface into streams and thence to the sea, and second by exhaustion through wrong methods of cultivation. The former process has gone far. Thousands of acres in the East and South have been made unfit for tillage. North Carolina was, a century ago, one of the greatest agricultural states of the country and one of the wealthiest. Today as you ride through the South you see everywhere land gullied by torrential rains; red and yellow clay banks exposed where once were fertile fields; and agriculture reduced because its main support has been washed away. Millions of acres, in places to the extent of one-tenth of the entire arable area, have been so injured that no industry and no care can restore them. [Applause]

Far more ruinous, because universal and continuing in its effects, is the process of soil exhaustion. It is creeping over the land from East to West. The abandoned farms that are now the playthings of the city's rich or the game preserves of patrons of sport, bear witness to the melancholy change. New Hampshire, Vermont, Northern New York, show long lists of them. In Western Massachusetts, which once supported a flourishing agriculture, farm properties are now for sale for half the cost of the improvements. Professor Carver, of Harvard, has declared after a personal examination of the country that "Agriculture as an independent industry, able in itself to support a community, does not exist in the hilly parts of New England."

The same process of deterioration is affecting the farm lands of Western New York, Ohio and Indiana. Where prices of farms should rise by increase of population, in many places they are falling. Between 1880 and 1900 the land values of Ohio shrank $60,000,000. Official investigation of two counties in Central New York disclosed a condition of agricultural decay. In one, land was for sale for about the cost of improvements, and 150 vacant houses were counted in a limited area; in the other, the population in 1905 was nearly 4,000 less than it was in 1855.

Practically identical soil conditions exist in Maryland and Virginia, where lands sell at from $10 to $30 an acre. In a hearing before an Industrial Commission, the chief of the Bureau of Soils of the Department of Agriculture said: "One of the most important causes of deterioration, and I think I should put this first of all, is the method and system of agriculture that prevails throughout these states. Unquestionably the soil has been abused." The richest region of the West is no more exempt than New England or the South. The soil of the West is being reduced in agricultural potency by exactly the same processes which have driven the farmer of the East, with all his advantage of nearness to markets, practically from the field.

Within the last 40 years a great part of the richest land in the country has been brought under cultivation. We should, therefore, in the same time, have raised proportionately the yield of our principal crops per acre; because the yield of old lands, if properly treated, tends to increase rather than to diminish. The year 1906 was one of large crops and can scarcely be taken as a standard. We produced, for example, more corn that year than had ever been grown in the United States in a single year before. But the average yield per acre was less than it was in 1872. We are barely keeping the acre-product stationary. The average wheat crop of the country now ranges from 12½ bushels in ordinary years to 15 bushels per acre in the best seasons. And so it is on down the line.

But the fact of soil waste becomes startlingly evident when we examine the record of some states where single cropping and other agricultural abuses have been prevalent. Take the case of wheat, the mainstay of single-crop abuse. Many of us can remember when New York was the great wheat-producing state of the Union. The average yield of wheat per acre in New York for the last 10 years was about 18 bushels. For the first five years of that 10-year period it was 18.4 bushels, and for the last five years 17.4 bushels. Farther west, Kansas takes high rank as a wheat producer. Its average yield per acre for the last 10 years was

14.16 bushels. For the first five of those years it was 15.14 and for the last five years 13.18. Up in the Northwest, Minnesota wheat has made a name all over the world. Her average yield per acre for the same 10 years was 12.96 bushels. For the first five years it was 13.12, and for the last five 12.8. We perceive here the working of a uniform law, independent of location, of soil, or of climate. It is the law of a diminishing return due to soil destruction. Apply this to the country at large, and it reduces agriculture to the condition of a bank whose depositors are steadily drawing out more money than they put in.

What is true in this instance is true of our agriculture as a whole. In no other important country in the world, with the exception of Russia, is the industry that must be the foundation of every state at so low an ebb as in our own. According to the last census the average annual product per acre of the farms of the whole United States was worth $11.38. It is little more than a respectable rental in communities where the soil is properly cared for and made to give a reasonable return for cultivation. There were but two states in the Union whose total value of farm products was over $30 per acre of improved land. The great state of Illinois gave but $12.48, and Minnesota showed only $8.74. No discrimination attaches to these figures, where all are so much at fault. Nature has given to us the most valuable possession ever committed to man. It can never be duplicated, because there is none like it upon the face of the earth. And we are racking and impoverishing it exactly as we are felling the forests and rifling the mines. Our soil, once the envy of every other country, the attraction which draws millions of immigrants across the seas, gave an average yield for the whole United States during the 10 years beginning with 1896 of 13.5 bushels of wheat per acre. Austria and Hungary each produced over 17 bushels per acre, France 19.8, Germany 27.6 and the United Kingdom 32.2 bushels per acre. For the same decade our average yield of oats was less than 30 bushels, while Germany produced 46 and Great Britain 42. For barley the figures are 25 against 33 and 34.6; for rye 15.4 against 24 for Germany and 26 for Ireland. In the United Kingdom, Belgium, The Netherlands and Denmark a yield of more than 30 bushels of wheat per acre has been the average for the past five years.

When the most fertile land in the world produces so much less than that of poorer quality elsewhere, and this low yield shows a tendency toward steady decline, the situation becomes clear. We are robbing the soil, in an effort to get the largest cash returns from each acre of ground in the shortest possible time and with the least possible labor. This soil is not mere dead matter, subject to any sort of treatment with impunity. Chemically, it contains elements which must be present in certain proportions for the support of vegetation. Physically, it is made up of matter which supplies the principal plant food. This food, with its chemical constituents in proper admixture, is furnished by the decomposition of organic matter and the disintegration of mineral matter that proceed together. Whatever disturbs either factor of the process, whatever takes out of the soil an excessive amount of one or more of the chemical elements upon which plant growth depends, ends in sterility. Any agricultural methods that move in this direction mean soil impoverishment; present returns at the cost of future loss; the exhaustion of the land, exactly as the animal system is enfeebled by lack of proper nourishment.

Our agricultural lands have been abused in two principal ways; first by single cropping, and second by neglecting fertilization. It is fortunate for us that nature is slow to anger, and that we may arrest the consequence of this ruinous policy before it is too late. In all parts of the United States, with only isolated exceptions, the system of tillage has been to select the crop which would bring in most money at the current market rate, to plant that year after year, and to move on to virgin fields as soon as the old farm rebelled by lowering the quality and quantity of its return. It is still the practice; although diversification of industry and the rotation of crops have been urged for nearly a century and are today taught in every agricultural college in this country. The demonstration of the evils of single cropping is mathematical in its completeness. At the experiment station of the Agricultural College of the University of Minnesota they have maintained 44 experimental plots of ground, adjoining one another, and as nearly identical in soil, cultivation, and care as scientific handling can make them. On these have been tried and compared different methods of crop rotation and fertilization, together with systems of single cropping. The results of ten years' experiment are now available. On a tract of good ground sown continuously for 10 years to wheat, the average yield per acre for the first five years was 20.22 bushels and for the next five 16.92 bushels. Where corn was grown continuously on one plot while on the plot beside it corn was planted but once in five years in a system of rotation, the average yield of the latter for the two years it was under corn was 48.2 bushels per acre. The plot where corn only was grown gave 20.8 bushels per acre for the first five and 11.1 bushels for the last five-year period, an average of 16 bushels. The difference in average of these two plots was 32.2 bushels, or twice the total yield of the ground exhausted by the single crop system. The corn grown at the end of the 10 years was hardly hip high, the ears small and the grains light. But the cost of cultivation remained the same. And the same is true of every other grain or growth when raised continuously on land unfertilized. We frequently hear it said that the reduction in yield is due to the wearing out of the soil as if it was a garment to be destroyed by the wearing. The fact is that soils either increase or maintain their productivity indefinitely under proper cultivation. If the earth, the great mother of human and animal life, is to "wear out," what is to become of the race? [Applause]

The two remedies are as well ascertained as is the evil. Rotation of crops and the use of fertilizers act as tonics upon the soil. We might expand our resources and add billions of dollars to our national wealth by conserving soil resources, instead of exhausting them as we have the forests and the contents of our mines. For there is good authority for the assertion that the farmer could take from the same area of ground in four years' grain crops as much as seven years now give him; leaving the products of the other three years when the land rested from grain as a clear profit due to better methods.

He can do far more than that by joining live stock raising with grain raising. Nature has provided the cattle to go with the land. There is as much money in live stock as there is in grain. Looked at in any way there is money in live stock; money for dairy products, money for beef, money for the annual increase, and most money of all for the next year's crop when every particle of manure is saved and applied to the land.

We need not consider at present really intensive farming, such as is done by market gardeners with high profit, or such culture as in France, in Holland, in Belgium, and in the island of Jersey produces financial returns per acre that seem almost beyond belief. The average in money per acre of the island of Jersey for each acre of cultivated land is over $250. What our people have to do is to cover less ground, cultivate smaller farms so as to make the most of them instead of getting a scant and uncertain yield from several hundred acres, and raise productivity by intelligent treatment to twice or three times its present level.

There is more money in this system. The net profit from an acre of wheat on run-down soils is very small; consequently decreasing the acreage of wheat under certain conditions will not materially decrease profits. Here are some reliable estimates. The price of wheat is given from the United States Department of Agriculture Yearbook, average for ten years:

Yield in bushels	Price	Market value per acre	Cost of production, including rent	Net profit or loss, per acre
20	$0.638	$12.76	$7.89	+ $4.87
16	.638	10.21	7.89	+ 2.32
12	.638	7.66	7.89	− .23
10	.638	6.38	7.89	− 1.51
8	.638	5.10	7.89	− 2.79

From the above table it will be seen that as large a net profit is realized from one crop of 20 bushels per acre as from two crops of 16 bushels; and that a 12 bushel crop or less yields a net loss—that is, provided the land is charged with a rental of $2.50 an acre. It is a safe conclusion that 75 acres of land, growing a crop of clover every fourth year will yield a larger net profit than will 100 acres sown to grain continually. A small field of eight acres of clover in the Red River Valley last year yielded 42 bushels (worth over $60) per acre, the value coming from the sale of seed.

I have dwelt upon the conservation of farm resources because of the commanding importance of this industry and because of its relation to our future. Nearly 36% of our people are engaged directly in agriculture. But all the rest depend on it. In the last analysis, commerce, manufactures, our home market, every form of activity, run back to the bounty of the earth by which every worker, skilled and unskilled, must be fed, and by which his wages are ultimately paid. The farm products of the United States in 1906 were valued at $6,794,000,000 and in 1907 at $7,412,000,000. All of our vast domestic commerce, equal in value to the foreign trade of all the nations combined, is supported and paid for by the land. Of our farm areas only one-half is improved. It does not produce one-half of what it could be made to yield; not by some complex system of intensive culture, but merely by ordinary care and industry intelligently applied. It is the capital upon which alone we can draw through all the future, but the amount of the draft that will be honored depends on the care and intelligence given to its cultivation. Were any statesman to show us how to add $7,000,000,000 annually to our foreign trade, it would be the sensation of the hour. The way to do this in agriculture is open. Our share in the increase would not be the percentage of profit allowed by successful trading, but the entire capital sum. On the other side stands the fact that the unappropriated area suitable to farm purposes is almost gone, and that we have been for the last century reducing the producing power of the country. Nowhere in the range of national purposes is the reward for conservation of a national resource so ample. Nowhere is the penalty of neglect so threatening. [Applause]

By the fixed rate of increase in the past, we must count upon a population of over 200,000,000 in the United States in the year 1950. The annual increase from natural growth is about one and one-half per cent each year. Adding for immigration only 750,000 a year, which is less than three-quarters of the figures reached in recent years, we shall have about 130,000,000 people in 1925, and at least 200,000,000 by the middle of the century. Where are they to go, how are they to be employed, how fed, how enabled to earn a living wage? The pressure of all the nations upon the waste places of the earth grows more intense as the last of them are occupied. We are approaching the point where all our wheat product will be needed for our own uses, and we shall cease to be an exporter of grain. There is still some room in Canada, but it will soon be filled. The relief will be but temporary. Our own people, whose mineral resources will by that time have greatly diminished, must find themselves thrown back upon the soil for a living. If continued abuse of the land should mark the next fifty years as it has the last, what must be our outlook?

Even the unintelligent are now coming to understand that we cannot look to our foreign trade for relief from future embarassment. Our total exports, about one-fourth in value of the products of our farms, consist to the extent of more than 70% of articles grown on the soil or directly sustained by it, such as live-stock, or made from soil products, such as flour. Of all the materials used in manufacture in this country, 42% are furnished by the soil. We shall have less and less of this agricultural wealth to part with as population increases. And as to enlarging greatly our sale of manufactured products in the world's markets, it is mostly a dream. We cannot finally compete there, except in a few selected lines, without a material lowering of the wage scale at home and a change in the national standard of living which our people are not ready to accept without a struggle. When capital cannot find a profit, there will be no money for the payrolls of an unprofitable business. Doubtless as we grow we shall buy more and sell more; but our main dependence half a century ahead must be on ourselves. The Nation can no more escape the operation of that law than can the man. It is time to set our house in order. [Applause]

Not only the economic but the political future is involved. No people ever felt the want of work or the pinch of poverty for a long time without reaching out violent hands against their political institutions, believing that they might find in a change some relief from their distress. Although there have been moments of such restlessness in our country, the trial has never been so severe or so prolonged as to put us to the test. It is interesting that one of the ablest men in England during the last century, a historian of high merit, a statesman who saw active service, and a profound student of men and things, put on record his prophecy of such a future ordeal. Writing to an American correspondent 50 years ago, Lord Macauley used these words:

> As long as you have a boundless extent of fertile and unoccupied land your laboring population will be found more at ease than the laboring population of the Old World; but the time will come when wages will be as low and will fluctuate as much with you as they do with us. Then your institutions will be brought to the test. Distress everywhere makes the laborer mutinous and discontented and inclines him to listen with eagerness to agitators who tell him that it is a monstrous iniquity that one man should have a million and another cannot get a full meal. * * * The day will come when the multitudes of people, none of whom has had more than half a breakfast or expects to have more than half a dinner, will choose a legislature. Is it possible to doubt what sort of legislature will be chosen? * * * There will be, I fear, spoliation. The spoliation will increase the distress; the distress will produce

fresh spoliation. * * * Either civilization or liberty will perish. Either some Cæsar or Napoleon will seize the reins of government with a strong hand, or your Republic will be as fearfully plundered and laid waste by barbarians in the twentieth century as the Roman Empire in the fifth.

We need not accept this gloomy picture too literally, but we have been already sufficiently warned to prevent us from dismissing the subject as unworthy of attention. Every nation finds its hour of peril when there is no longer free access to the land, or when the land will no longer support the people. Disturbances within are more to be feared than attacks from without. Our Government is built upon the assumption of a fairly contented, happy, and prosperous people, ruling their passions, with power to change their institutions when such change is generally desired. It would not be strange if they should in their desire for change attempt to pull down the pillars of their national temple. Far may this day be from us! But since the unnecessary destruction of our land will bring new conditions of danger, its conservation, its improvement to the highest point of productivity promised by scientific intelligence and practical experiment, appears to be a first command of any political economy worthy of the name. [Applause]

I have endeavored to outline some of the principal issues at stake in the better conservation of our national resources, and especially that one about which all the others revolve and by whose fortunes we shall eventually stand or fall—the land itself. They are for us quite literally the issues of national existence. The era of unlimited expansion on every side, of having but to reach out and seize any desired good, ready provided for us by the hand that laid the foundations of the earth, is drawing to a close. The first task, it seems to me, must be to force home the facts of the situation into the public consciousness; to make men realize their duty toward coming generations exactly as the father feels it a duty to see that his children do not suffer want. In a democracy this is a first essential. In other forms of government one or two great men may have power to correct mistakes, and to put in motion wise policies that centuries do not unsettle. A part of the price of self-government is the acceptance of that high office and imperative duty as a whole by the people themselves. They must know, they must weigh, they must act. Only as they form and give effect to wise decisions can the nation go forward. And we should not be here today were it not that the principle of a conservation of national resources as the foremost and controlling policy of the United States henceforth is coming to be seen by many, and must be heartily accepted by all, as the first condition not only of continued material prosperity, but also of the perpetuation of free institutions and a government by the People. The work now being done by the Department of Agriculture and the agricultural colleges of the various states, furnishes a broad and intelligent foundation upon which to build up a new era of national progress and prosperity. It calls for a wise, generous and continuing policy on the part of both Federal and State governments. [Applause]

If this patriotic gospel is to make headway, it must be by just such organized missionary work as is here begun. It cannot go on and conquer if imposed from without. It must come to represent the fixed idea of the People's mind, their determination and their hope. It can not be incorporated in our practical life by the dictum of any individual or any officer of Nation or State in his official capacity. It needs the cooperation of all the influences, the help of every voice, the commendation of Nation and State that has been the strength and inspiration of every worthy work on American soil for 120 years. We return, for our gathering in council and for our plan of action for the future, to the model given us by the Fathers. State and Nation are represented here, without jealously or any ambition of superiority on either side, to apply to the consideration of our future such cooperation as that out of which this Nation was born and by which it has won to worthy manhood. Reviving the spirit of the days that created our Constitution, the days that carried us through civil conflict, the spirit by which all our enduring work in the world has been wrought; taking thought as Washington and Lincoln took thought, only for the highest good of all the People, we may, as a result of the deliberations held and the conclusions reached here today, give new meaning to our future, new lustre to the ideal of a Republic of living federated states; may shape anew the fortunes of this country, and enlarge the borders of hope for all mankind. [Long and continued applause]

The PRESIDING OFFICER (Governor JOHNSON): The next statement on the official calendar is an address on "Soil Wastage," by Professor Chamberlin. [Applause]

SOIL WASTAGE

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Mr President, Governors, Gentlemen:

The invitation to give thought to the resources that affect our future appeals to me with peculiar force, for my studies of the past decade have led to the belief that the era of the earth's future habitability is vastly greater than we have been wont to think. We have grown up in the belief that the earth sprang from chaos at the opening of our era and is plunging on to catastrophe or to a final winter in the near future. Quite at variance with this, I have come to believe that the earth arose from a regenerative process and that it offers a fair prospect of fitness for habitation for ages yet to come. If this be true, it is eminently fitting that our race should give a due measure of thought to the ulterior effects of its actions. These considerations especially intensify the problem of that resource on which our civilization so profoundly depends, as has been said before us with such cogency and eloquence.

It is one of the latest conceptions of geology that climatic conditions have been of the same order as at present from early eras, in the large view, in spite of some notable variations, and that this uniformity is the result of *a profound regulative system* which has sufficed to keep the temperature of the earth's surface and the constitution of the earth's atmosphere within the narrow range congenial to life for a vast period. As a result there has been no break in the continuity of land life since it came into being eras ago. It appears further that the sources of supply of the vital elements are still adequate, and are likely to be so for long ages, that the regulative system is still in effective control, and that a vast future of habitability may fairly be predicted. Whether you are prepared to accept so large a view of the habitable future or not, I trust you will strike hands with me in the conviction that the probabilities of the future are at least so great as to render imperative the serious consideration of our obligations toward it.

It is a familiar geologic deduction that for long eras rains have fallen on the lands, and soils have grown in depth while the surface has been washed away. Production and removal have run hand in hand, and yet they have been controlled to such a degree by the adjustments of nature that no part of the surface seems ever to have been so far denuded that plants could not flourish upon it. More than this, it appears that the ordinary adjustments of nature make for increasing fertility of soil rather than depletion. It is true that at intervals deformations of the earth have intervened, giving mountainous heights and precipitous surfaces from which the soil-product has been washed faster than it could be produced; but these diastrophic effects are perhaps rather rejuvenations necessary to the preservation of the continents than destructive episodes. Whenever such heights and slopes have been raised, the atmosphere and its waters have at once begun to grade them down, to cover them with soil, and to give to them a renewed habitability. So, in these and other ways, the gifts of the great past now present themselves to us as the product of a marvelous system of control which has checked excesses and forced movement toward the means in which has lain productivity and congeniality to life. Thus has come our inheritance of a land suitable for habitation, of a soil-mantle of great fertility, of a precipitation conducive to productiveness, and of a system of streams endowed with great possibilities of water-foods, of power, and of navigation.

We do not hesitate to enter into the inheritance; but what part shall we take in this regulative system that produced and maintains it? How shall we cooperate with nature in rendering conditions still more serviceable to ourselves, and in transmitting a still greater inheritance to our successors? Clearly we may use the proper revenues of our inheritance, but surely we should not rob our successors of their share in it! [Applause]

Let us turn at once to the basal factor in the problem, the rainfall, the soil, and the soil-wastage, the special theme of this hour. The rainfall is an inherited asset, the soil is an inherited asset, even a little soil removal is an asset, but reckless soil-wastage is a serious error. Soils are the product of the atmosphere and its waters modifying the rock surface. When the atmospheric waters have aided the air in producing soil by rock decay they may pass, on the one hand, into plants or back to the surface soil, and thence to the atmosphere by evaporation, or, on the other hand, they may pass on down to the ground-waters and thence into the streams. The alternative is to rush away as foul erosive floods on the surface, wasting soil and plant food, gullying the surface, choking the ravines, flooding the valleys, silting the pools, filling the reservoirs, sweeping out the dams, barring the streams and clogging the harbors. If it shall be found that all or nearly all the waters should go into the soil and thence into the underdrainage, coming out slowly and steadily by seepage and by springs into the streams, clear and pure, these streams should present nearly ideal conditions for water-food, for power, and for navigation. The solution of the soil problem may therefore be, in large part, the solution of the whole complex of problems of which navigation is the last term. It may thus prove to be the *key* problem.

To see more definitely if this be so or not, we must turn to details; and yet, with the brevity that is imperative, we may only look at major details, passing by the multitude of special cases, not to say exceptions.

While soils are formed by the action of the atmosphere and its waters on and in the underlying rock (aided by plants and animals), their surfaces are carried away by wind and wash. At any instant, then, the depth of the soil measures the lag of removal behind production. It is well that we hasten to note that the addition of new soil below and the loss of exhausted soil above are alike tributary to permanent fertility, and the highest productivity springs from *the proper ratio* of basal addition to surface wastage.

We have as yet no accurate measure of the rate of soil production. We merely know that it is *very slow*. It varies obviously with the kind of

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rock. Some of our soils are derived from material already reduced to a finely pulverized condition. Such are the lowland accumulations from highland wash. Such also is the glacial drift, rock-flour rasped from the face of the ledge by the glacial file, and ground up with old soils. On such a base of half-prepared material, soils may be developed with relative rapidity; but even on these, when the slope is considerable, wind, wash and cropping remove the surface much too fast for stable fertility. For average rock, under ordinary conditions, in our range of climate, the usual estimate has been a foot of waste in from 4,000 to 6,000 years, which includes channel-cutting and bank-undermining. These are too rapid for ordinary soil waste and replacement under our normal natural conditions. Without any pretensions to a close estimate, I should be unwilling to name a mean rate of soil-formation greater than one foot in 10,000 years on the basis of observations since the glacial period. I suspect that if we could positively determine the time taken in the formation of the four feet of soil next to the rock over our average domain, where such depth obtains, it would be found above rather than below 40,000 years. Under such an estimate, to preserve a good working depth, surface wastage should not exceed some such rate as one inch in a thousand years. If one chooses to indulge in a more liberal estimate of the soil-forming rate, it will still appear, under any intelligent estimate, that surface wastage is a serious menace to the retention of our soils under present modes of management. Historical evidence enforces this danger. In the Orient there are large tracts almost absolutely bare of soil, on which stand ruins implying former flourishing populations. Other long-tilled lands bear similar testimony. It must be noted that more than loss of fertility is here menaced. It is the loss of the soil-body itself, a loss almost beyond repair. When our soils are gone, we too must go, unless we shall find some way to feed on raw rock or its equivalent. The immense tonnage of soil-material carried out to sea annually by our rivers, even when allowance is made for laudable wash, and for material derived from the river channels, is an impressive warning of the danger of negligent practices. Nor is this all; the wash from one acre is often made the waste-cover for another acre, or for several. Sometimes one's loss is another's gain, but all too frequently one's loss is another's disaster; and the 1,000,000,000 or more tons of richest soil-matter annually carried into the sea by our rivers is the Nation's loss. [Applause]

If the atmospheric waters may not run off the surface freely without serious menace, where may they go and what may they do consistent with our welfare? The answer lies in a return to the study of the origin and internal work of soils. For necessary brevity, let us neglect all secondary soils, or overplacements, and consider simply the origin and activities of primary soils derived from primary rocks. The action of air and water in producing soil from such rock is partly chemical and partly physical. Certain rock substances are made soluble and become plant food or plant poisons, while others remain relatively insoluble but are reduced to a finely divided state and form the earthy element of the soil.

Some of the soluble substances thus formed at the base of soils are necessary plant food, while some are harmful; but what is more to the point, all are harmful if too concentrated. There is need therefore that enough water pass through the forming soil, and on down to the groundwater and out through the underdrainage, to carry away the excess of these products. An essential part of the best adjustment is thus seen to lie in *a proper apportionment of the amount of water which goes through the soils*. If this be not enough, the plants will suffer from saline excess; if it be too much, the plants may suffer from saline deficiency.

When evaporation from the surface is active and prolonged, waters which had previously gone down to the zone of soil-formation and taken up soluble matter re-ascend, bringing the soluble matter up and leaving it at the surface on evaporation. Up to a certain point this is favorable to the plant; beyond the critical point it begins to be harmful, as abundantly shown in the "alkaline" efflorescences of arid regions.

Besides the water that goes through the soil into the subdrainage, and that which runs off on the surface, enough must be held *at all times in the soil during the growing season* to supply the plants, and yet not enough to water-log the soil.

Here, then, lie a series of possible excesses and deficiencies; between them falls the golden mean which gives best results. Thus the problem of soil management is a problem of proper balancings and adjustments, a problem to be solved by science and common-sense forced to their best by the energy and intelligence of the American farmer. [Applause]

The key to the problem of soil conservation lies in due control of the water which falls on each acre. This water is an asset of great possible value. It should be looked upon as such. It should be computed by every acre-owner as a possible value, saved if turned where it will do good, lost if permitted to run away, doubly lost if it carries also soil values and does destructive work below. Let us repeat the story of its laudable paths. A due portion of the rainfall should go through the soil to its bottom *to promote soil-formation* there; a due portion of this should go on into the underdrainage *carrying away harmful matter;* a due portion should go again *up to the surface carrying solutions needed by the plants;* a due portion should obviously go into the plants to nourish them; while still another portion should run off the surface, carrying away a little of the leached soil matter. There are a multitude of important details in this complex of actions but they must be passed by; the great features are clear and imperative.

Experimental studies have shown that, on the average within our domain, *crops can use to advantage all the rainfall during the growing season*, and that, *in most cases, crops are the better for all the stored supplies that can be carried over from the non-growing seasons.* This greatly simplifies the general problem, for it justifies the conclusion—to which there are many local exceptions, of course—that the highest crop-values will usually be secured when the soil is made to absorb as much of the rainfall and snowfall as practicable. In securing this maximum absorption and internal soil-work, the run-off, and hence the surface wash, will be reduced to a minimum. It has already been seen that the wash of even this inevitable minimum is likely to be still too great to keep the proper slow pace with soil-generation, when the surface has much slope. Except on nearly level ground and on lodgment surfaces, there need be no solicitude about a sufficient removal of the soil matter. The practical problem then lies almost wholly in retaining and passing into the soil the maximum of the precipitation. Obviously, this gives the minimum of wash to foul the streams, to spread over the bottom lands, to choke the reservoirs, to waste the water-power, and to bar up the navigable rivers. *The solution of the problem for the tiller of the soil essentially solves the whole train of problems running from farm to river and from crop-production to navigation.* [Applause]

Time fails now to point out the ways in which the control of the soils and the waters may be effected; this will follow in the later paragraphs soon to be placed in your hands. [Applause]

Nature has been working on the complex problems of balance between soil formation, soil waste, surface slope, plant growth, and stream development for uncounted ages, and we have inherited the result—a magnificent patrimony. The larger part of our domain, when invaded by us, had reached a fair adjustment of slopes to precipitation, was covered with a soil-mantle of fair depth and high average fertility, and was clothed with rich vegetation. There were exceptions to this, and some of these were large; but they may be passed over in a general view.

Looking at nature's methods for suggestions, we note that a much larger variety of plants are used by nature to cover and protect the soil than we use, and that these have a wider range of adaptation to the special situations where protection is needed. This invites the inquiry whether it is not possible to follow this precedent further than we have done by developing a larger number of profitable plants, among which shall be more that are adapted to protecting the surface, and to growing on slopes specially subject to wash. Forest trees are an important resource of this kind and should be employed as fully as practicable, as will, no doubt, be urged with great cogency by those who discuss the problem of forestry. We also have many berry-bearing shrubs, vines, and fruit trees, whose employment to the maximum in covering slopes is likewise urged either alone or in conjunction with forests—though berries and fruits are perishable and have limitations of preservation, transportation, market, etc. But if shrubs could be evolved by modern selective methods whose nut-meats or dry seeds would be suitable for food in place of the watery pulp, and which could be treated much as cereals are, and have equally wide year-round markets, there would be a larger choice of crops to grow in soils subject to wash, and we might secure soil-protection with less crop-limitation. There would then be less need to press the culture of the cereals so far as we do now, and they could be limited more largely to surfaces less subject to harmful soil-loss.

Another marked feature of nature's method is the development of plant-societies, or from our point of view, combination-crops. There can be no doubt that there is much deleterious crowding and repressive rivalry among the natural mixtures of plants, but at the same time, there seem to be associations that are mutually beneficial. No doubt man secures a great temporary advantage by isolating chosen plants and freeing them from competition, but this is clearly at some permanent disadvantage which is partially corrected by rotation, fertilizing, and tilth. Cannot a greater advantage be secured by a larger use of the combination method? It is clear that legumes and cereals are helpful associates in rotation and in some combinations. May not this be pushed so far by skillful selection and proper culture that legumes and helpful associates may replace weeds in becoming the constant and spontaneous associates of cereal crops, so that, while kept in such subordination as to be the servants of the cereals, they may still aid in covering and protecting the soil, and thus guard against undue surface loss? Certainly much can be done by such plants, used as fall and spring crops, to cover the soil when specially exposed to wastage.

The full list of tried methods should be pressed into the utmost employment.

Since a chief object is to cause the maximum of rainfall to be absorbed into the soil, it is obvious that all methods of culture and all crops that increase the granularity and porosity of the soil contribute to the end sought. Deep tilth to promote soil granulation, and deep-rooting plants to produce root-tubes, are specific modes of great value.

Artificial underdrainage, by preventing the water-logging of the soil and by promoting its granulation, assists in absorption and transmission.

Contour cultivation, by arresting the direct descent of the waters on the surface and distributing them along the slopes, when properly controlled aids absorption and limits surface wash. On the steeper slopes, special devices may be used to supplement contour cultivation, such as strips of grass-land, or shrub-land, or wood-land, alternating with zones of plow-land. Reservoirs, either at the heads of ravines or at suitable heights in the ravines where surface wash is concentrated, may be used to arrest storm-floods; and if these are connected with lines of tile-drain following contours on either hand, the concentrated waters will be redistributed and at the same time transferred from the surface to the subsoil.

These and similar devices serve to limit the wash of the slopes, but the more radical and permanent remedies will, I think, be found in the development of values in trees, shrubs, vines, and grasses to such an extent that they may be employed almost exclusively in clothing the steeper slopes, where wash is most menacing and where the usual modes of culture that give rise to bare surfaces during portions of the year can scarcely fail to involve a degree of wash which cannot be replaced by soil growth below. Is not the time at hand when trees, shrubs, vines, grasses, and combinations of these, may be so developed and extended in value and availability by modern selective processes that they shall become sufficiently profitable crops to monopolize all the areas where wash threatens the ultimate removal of the whole soil? By such extension of these crops may not the bare-surface culture be so limited to relatively level lands as to cause in these, when intelligently handled, only that degree of surface loss which they can stand without menace to the perpetuity of the soil?

But a critical question remains to be answered: Can such modes of soil-management and crop-selection be made to give reasonable profits? Before we can hope that the millions who till the soils will join effectively in a radical scheme of soil-conservation, it must be made to appear that it will give some reasonable returns at every large stage of its progress; must pay, let us say, in the long run of a lifetime. We may fairly assume that intelligent people will be guided by the total returns of a lifetime, in lieu of beguilement by the ultra-quick returns of forced and wasteful cropping in total neglect of later results. It may be assumed that he who tills a farm from his twentieth to his sixtieth year will find more satisfaction in the summed profits of forty crops of increasing value enhanced by the higher value of his land at the end, even though the margin above cost be no greater, than in the sum of forty crops of decreasing values with a debased value of the land at the end. Our practical problem is therefore to so improve processes, to so increase intelligent management, and to so exalt the point of view, that every step in the processes proposed shall give satisfactory returns for the labor involved. How far this is practicable just now, I must leave to those whose technical knowledge in the practical art of tillage fits them to answer, but in any event it seems that this must become so in time; for if the loss of soils proceeds at the present rate and the number of inhabitants continues to increase as now, the value of the residue of tillable land which will remain after a few centuries will so appreciate as to force extreme measures for its conservation. The pitiable struggles of certain Oriental peoples to retain and cultivate the scant remnants of once ample soils is both an example and a warning. Our escape from such a dire struggle should spring from a clearer forevision, a deeper insight, greater technical skill, and indefatigable industry.

[*Note*.—Much valuable literature bearing on this and kindred subjects will be found in the numerous publications of the U. S. Department of Agriculture and the several State Agricultural Stations. Notable among these is the Farmers Bulletin No. 20, on "Washed Soils," and a special contribution to "Soil Erosion," prepared for the Secretary by W J McGee; together with an article by the same author on "The Beginning of Agriculture." The fundamental work on "Rocks, Weathering and Soils" by Dr Geo. P. Merrill of the National Museum is also to be noted. Particularly valuable are the writings of Professor F. H. King on "Soils," "Soil Physics" and "Soil Management," and, especially for the south and west, the work on "Soils," by Professor E. W. Hilgard.]

The PRESIDING OFFICER (Governor JOHNSON): The next opening statement on our program is "Forest Conservation" by R. A. Long. [Applause]

FOREST CONSERVATION

R. A. LONG

Mr President and Gentlemen:

President Roosevelt, in addressing a body of business men in June, 1903, among other things said: "The forest problem is in many ways the most vital internal problem before the American public today," and that "the more closely this statement is examined, the more evident its truth becomes."

I want thus early in my address to lend emphasis to this statement, for coming from such a source and from one so prolific of good deeds pertaining to public matters, and one who has given such careful study and arrived at such wise conclusions concerning so many of the live and vitally important subjects before us in recent years, it should induce our minds to be in a most receptive mood, and if what we have to say is true and practicable, it is advisable that it shall find such lodgment in the minds of our people as will compel action, and result in carrying out the purposes for which this conference is called.

Since I was to be honored with a place on this platform, I am glad this subject was left for me; for it has to do with a thrilling, throbbing, and beautiful life, which is less true of any of the other subjects to be discussed.

True, some of our forests, as it were, lay aside their beautiful gowns in the fall, passing apparently into sleep, in which condition they remain until spring, when again they don a garb even more beautiful—not of silk or satin, trimmed with gorgeous ornamentation of man-made goods, but of a kind fashioned by an artist who makes no mistakes, and never fails to please the most fastidious and artistic.

The remainder of our magnificent forests, and much the larger part, continues to wear its mantle of green, not only during the springtime and in the summer days, but defies the frosty fall season and [illegible] zero weather of the wintry days. The tree has ever been the symbol of life, strength, beauty, and of rest, and the eye of man cannot continue to look, day after day, upon these stately God-given queens of nature without their beauty being reflected in his life, making him a healthier, happier, and a better man; and their destruction means not only the removal of one of our most desirable natural resources, from a practical and utilitarian standpoint, but from the viewpoint of health, morality, spirituality, and beauty, their loss would be without remedy. [Applause]

There is much more that might be said on the esthetic side of this subject, but I refrain and pass on to the practical side.

I want to lay down, first, the broad proposition that, aside from the soil itself, no other natural resource compares with our forests. Can you think of one that comes so nearly supplying every want of man? From the tender, touching song we hear "There is no place like home"—that place so sacred to every one worthy to wear the title of man—and we know that there is no other resource under the sun that supplies so many homes in every essential as does the tree, especially as applied to the large majority of our people, those whose labors go hand in hand with the prosperity of our nation.

However crude the workman, with only an ax for his tool, he may go into the forest and build a comfortable home in which to live. The leaves and bark of the tree may be converted into clothing for his body, and the nuts and fruits give him sustenance. Look within the house, be it shanty or mansion, and the furniture will remind you of this natural resource.

The ties supporting the great railway systems of this country, and nearly all the buildings connected therewith, are of its product.

The mines of coal, copper, gold, silver—yea, all minerals from the cheapest to the dearest, require its use for their production and our satisfaction.

We are using not less than one hundred and sixty-five million cubic feet annually in this direction.

What of the millions and millions of tons of paper on which is printed the news by our great daily newspapers, making it possible for even the poorest inhabitants of all the nations of the earth to keep posted as to the daily happenings of the world?

It is claimed, and I believe truthfully, that at least 99% of the products of our forests are used for practical and useful purposes; yet of the total quantity of these products but a small fraction is actually utilized, probably three-quarters going to waste.

It is conceded also that forests aid much in the utilization of our rainfall, as the leaves and branches of trees and the accumulation of humus and leaf-mould resist the compacting effect of the rain drops, and hence the soil is kept loose, allowing the water to readily percolate. This covering of loose litter, twigs, etc., absorbs and holds back the precipitation, preventing its disappearing rapidly by surface drainage, goes largely into the ground, and as a subsoil or underground drainage reappears in the form of springs, which being gradually fed by percolation from above, themselves feed rivulets or streams of perennial character. The snows of winter melt more gradually in forest-covered areas, giving more time for the water resulting therefrom to soak into the ground and pass off through the springs. The streams fed from such sources have a continuous supply to be used for irrigation or such other purposes as man may require.

On the other hand, when the forest lands have been denuded, the rainfall passes rapidly away, and its resulting effect is not long felt or seen excepting by the filling of the channels of the stream by silt, sand, and gravel washed from above, and the result of the waters having spread over the adjacent low lands, destroying crops, improvements, live stock, and sometimes even the lives of the inhabitants. It is not unusual in some sections for the fertile valley lands to be destroyed by gravel, stones and debris carried and deposited by the waters.

Water power exerted through electrical energy, and in operation in so many industries, is impossible without constant and uniform water supply, and this cannot be had except along streams whose head waters have an adequate protection of forest covering; otherwise, the erosion of the soil soon fills the reservoirs, and waters running unobstructed on the surface, converge in great torrents, carrying logs and debris of all kinds, surging irresistibly through the river valleys, taking with it dams, gates, power plants and destroying what it cannot carry away.

Originally the rivers and even the rather small water courses of our country were to a greater or less extent navigable. Their channels were deep, their waters mostly clear and free from sediment and silt. At the present time, owing to the deforestation of the lands along their banks, and especially of their head waters, the breaking up of the sod and the loosening of the soil consequent upon settlement and cultivation of crops, these channels formerly deep, have been in some instances entirely filled, and everywhere rendered more shallow, until water transportation has ceased and river navigation has become almost obsolete on rivers which were once teeming with commerce.

Our Government is at great annual expense in the construction of levees, dikes, jetties and other devices to prevent the destructive overflows, and in dredging and deepening the channels in order that sufficient depth of water may be obtained and preserved to encourage the reestablishment and preservation of our waterway navigation, so that means of transportation, competitive with and supplemental to that furnished by our railroads may be had; a substantial proportion of the money and energy thus expended, if used in the preservation of our forests, would materially better conditions in this regard.

The western half of the United States contains enough fertile land, now barren and unprofitable, only because of insufficient moisture, to support under adequate irrigation a population of probably fifty million people; further than this, as it has been truly said, such population in the West would support a like additional population in the manufacturing districts of the East, and the two would support another large population engaged in the transportation and distribution of the commodities of commerce between them.

The possibility of such irrigation depends largely on the preservation of the forest cover of the mountains, which catches and holds the melting snows, and thus forms the great storage reservoirs of nature.

We have been for many years, and are now, using all our resources of diplomacy, and even almost threatening at times to reinforce it, if necessary, by our naval and military strength, to maintain an "open door" in the Far East for the benefit of our commerce, while at the same time we have only dimly realized the possibilities of building up an empire in our midst, whose yearly requirements of the commodities of commerce would equal the requirements of an equal number of inhabitants of the Far East for a generation, and the annual purchasing power of whose productive activities would amount to more than all the goods we could hope to sell through the "open door" in possibly more than a quarter of a century.

We have it upon the authority of the Holy Writ, that a thousand years before Christ the eastern shore of the Mediterranean was the seat of large cities having an extensive maritime commerce. The mountain region bordering east and west, extending for many miles inland, was covered with a dense forest, comprising the cedar of Lebanon, the fir and the sandal wood, covering an area of 3,500 square miles. The inhabitants of Sidon were largely engaged in cutting, hewing and shipping timbers from the forests of Lebanon, and the seat of Sidon was a great lumber market, and its citizens skilled ax-men.

The cities of Tyre and Sidon were largely constructed of wood; their ships built of cedar, the masts of fir, and oars of oak. Solomon procured all of the timbers used in the construction of the Temple, as well as in other buildings, from the forests of Lebanon by a contract therefor with Hiram, King of Tyre, in whose dominion they lay, and he supplied eighty thousand laborers to assist in cutting and hewing the trees. The timber was loaded into ships and conveyed to Joppa, thence by land to Jerusalem. The region about Jerusalem was fertile, and Solomon provisioned more than one hundred and fifty thousand men for a period of perhaps twenty years, and supplied Hiram with one hundred and fifty thousand measures of wheat, with as much barley, besides one hundred and fifty thousand gallons of wine, and a like quantity of oil annually, from which we must understand the country was rich and productive. These forests have all been destroyed, with no renewal thereof, and with their destruction disappeared the fertile soil. The rain-bearing clouds still float above the mountains of Syria; but they pass on over the bare and heated rocks, and the brooks and small streams of Palestine no longer exist, and throughout Syria stone furnishes the only material for building, and wood is as precious as silver.

May it not be true that the destruction of Tyre and Sidon was in great part in consequence of the destruction of these forests, which has rendered that country a barren desert, supplying a scanty sustenance to the sparse population—its beauty, its fertility, its usefulness gone? So the physical geographers assure us.

In "Sinai and Palestine," by Dean Stanley, an authoratitive record, appears the following: "The countless ruins of Palestine, of whatever date they may be, tell us at a glance that we must not judge the resources of the ancient land by its present depressed and desolate state. They show us, not only that 'Syria might support tenfold its present population, and bring forth tenfold its present product,' but that it actually did so. And this brings us to the question which eastern travelers so often ask, and are asked on their return, 'Can these stony hills, these deserted valleys, be indeed the Land of Promise, the land flowing with milk and honey?'"

The effect and influence of forests on the climate, health and water conditions of the country is evidenced by the chronicles of the Mosaic, the Roman and the Greek writers, and many of their far-seeing priests prevented the destruction of the forests. The consecration of groves to religious uses and to various mythological rites connected with them is an evidence of the reverence the ancients had for forests. Homer calls the mountain woodlands the "habitations of the gods, in which the mortals never felled the trees, but where they fell from age when their time had come;" and in his "Tree and Woodland Nymphs," originating in springs, he suggests the intimate relation of forests and springs.

Aristotle, in his "National Economy," points out that an assured supply of accessible wood material is one of the "necessary conditions of the existence of a city."

Plato writes that the consequences of deforestation is the "sickening of the country." Cicero, in one of his philippics, designates those engaged in forest devestation as the enemies of the public interests.

Mesopotamia, one of the most sterile coutries in the East, was once praised on account of its fertility, where, according to Herodotus, "the culture of the grape could not succeed on account of the moisture;" and the Euphrates River, once the source of an ample water supply, is swallowed up in this desert.

Greece shows the progress of a similar decadence. Sicily, the never-failing granary of the Roman Empire while it was well wooded, is now entirely deforested and crop failures are the rule. Cæsar and other Roman writers describe the "vast forests" throughout the entire territory. Since then, thousands of square miles have been deforested. Many countries, where the destruction has been most reckless, have taken systematic measures to control the destruction and secure the reproduction of exhausted areas. To this they have been driven, not only by the lack of timber and fuel, but also by the prejudicial effects exerted upon the climate and the irrigation of the country by this denudation.

In Denmark much of the woods, which at one time covered nearly the whole country, having been cut down to make way for agriculture and to supply fuel and timber, the vast area thus bared has become a sandy desert. Parts of Bohemia, Hungary, and Austria have been rendered practically valueless because the growing forests were destroyed.

In France, the frequent inundations of the last fifty years were caused, as is stated by writers, by the deforesting of the sources of the Rhone and the Saone. Since that time, thousands of acres are annually planted, and where the forests have been restored, the conditions have changed for the better.

In the American Forest Congress, in 1905, the Honorable John Lamb quoted the following from Bernard Palissy, which is so pregnant of truth that it will bear repeating: "For when the forests shall be cut all arts shall cease and they who practice them shall be driven out to eat grass with Nebuchadnezzar and the beasts of the field. I have at divers times thought to set down in writing the arts that would perish when there shall be no more wood, but when I had written down a great number, I did perceive that there will be no end of my writing, and having diligently considered, I found that there was not any which could be followed without wood, and I could well allege a thousand reasons, but it is so cheap a philosophy that the very chamber wenches if they do but think may see that without wood it is not possible to exercise any manner of human art or cunning."

China has paid absolutely no attention to the preservation of her forests; hardly a twig left in what was once her great forest fields, while Japan, close by, has 59% of her total area under forests, and the Government has reserved under its control a very large part of the whole. Compare the conditions of these two countries, side by side, and draw your own conclusions. While practically all other countries are effectually practising forestry, none of them I believe, save Sweden and Russia, foresaw the difficulties toward which they were drifting—at least, made any effort to provide against them until they found themselves importing lumber in great quantities.

One nation, Germany, paid out in a single year eighty million dollars, and still their timber reserves are being depleted at a rapid rate. Realizing into what condition she was drifting, she set at work to remedy the evil, and today is in the forefront in working out this great problem, and it is said not many years will elapse before she will be producing an annual crop equal to her consumption. This is most commendable, but it would have been much less expensive and more businesslike had she have exercised the same judgment and forethought in the manner our leading business men make use of in handling the problems affecting their interests today. As is usually true, those spending the most money in the development of an industry obtain the best net results. To illustrate, Germany and France are spending about $11,000,000 a year and reaping $30,000,000 net; while we, last year, spent $1,400,000, receiving $130,000.[a]

Considering all of the above, coupled with the fact that from the viewpoint of the value of annual production, it stands as the fourth greatest industry in the United States, being exceeded only by food and kindred products, the annual value of which is $2,845,234,900; textiles, $2,147,441,418; iron and steel and their products, $2,176,739,726; lumber coming fourth with an annual value of $1,223,730,336, which pays annually in wages about one hundred million dollars, providing an income and living for something like two millions of our people. Can it be passed lightly by without bringing the censure of the generation that will live after us, upon our heads?

But need we say more of the important part forests play in the affairs of our country, or what bearing they have had and are having on the nations of the world? It seems to me we should determine, if we can,

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[a] A very thorough exposition of this subject has been made by Mr Treadwell Cleveland, Jr., in Circular No. 140 of the Forest Service, and I urge its careful reading.

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the life of our forests under existing conditions, and upon the course necessary to their perpetuation.

In January, 1903, I prepared a paper on the subject of stumpage, to be read at a convention of lumbermen. I spent a vast deal of time in gathering the data necessary to its preparation; I took into account only the white and Norway pine of the Lake States, the yellow pine of the South, and the timber growing in the States of Oregon, Washington and California, as they were the only woods entering in any large way into the lumber supply of this country, calculating that long before any of the woods in question had been exhausted practically all other woods in our nation would have largely passed out of use.

My investigation led me to make a statement that the timber in the Lake States would not exceed sixty billion feet; that within ten years it would probably play no larger part in the lumber supply of this country than did poplar at that time. I see no reason to change that statement unless the effects following our recent panic, which are very depressing on the lumber industry, should continue longer than is now expected.

As to the life of the southern yellow pine, I gave it as my belief, that eighteen years would find it cutting no great figure in our lumber supply. I am more convinced of the correctness of this statement now than I was then. Adding the white pine, yellow pine, and Pacific Coast products together, my estimate was that the life for all was forty-one years. I am not so sure as to the amount of timber on the Pacific Coast, but I do not believe the total life of all will vary to exceed five years from the date indicated.

Some calculate that substitutes, such as cement, will likely curtail the demands for lumber; judging from the experience of other countries, it will not. Even in England, where nearly all of the lumber used is imported, their lumber consumption per capita is increasing at the rate of five per cent per annum. In France and this country it is increasing at the rate of 10% per capita. But why speculate on our timber supply, a question of such great importance to this nation, when definite information can be had? It is unlike any of our other natural resources. It all stands above the ground and can be estimated with great accuracy. Men and money are the only means necessary for securing this valuable information. The former can be had by supplying the latter. Should a nation as rich as ours hesitate to furnish the means required for information of such great value?

My plan would be to take our timber areas, and, working them by counties, parishes or townships, make a complete estimate, as if a purchase was to be made; where the timber was practically the same in several counties, townships, or parishes, near each other, a careful estimate of one, and a reckoning of others on the same basis, would be sufficiently accurate for all purposes. This would give us a correct basis to start with, and from which intelligent statements could be made in the future.

The owner of a given piece of property is controlled, as to retention or disposition, largely by the net results that may be obtained at different periods. Carrying charges, or the expense incident to holding a commodity or article of commerce, enter very largely into such calculations. Taxes constitute a large part of such charges, and have no little bearing on the subject under consideration. Instead of timber lands being favored in order to encourage their conservation, not only for the benefit of the owner, but for the use of generations yet unborn, they are not given an even chance with other properties.

The crop of the farmer is taxed when it is ready for the market, and no crop is taxed more than once. A crop of timber is taxed continuously and annually until disposed of. The farmer's crop matures yearly; the crop of the timber owner matures once in about a hundred years.

Let us illustrate: As the value of the timber is less in its earlier years than when matured, we will use fifty years as the average life, basing the value on the matured product. Rice, cotton and sugar lands in some sections of the South, in close proximity to timber lands, are assessed at about the same prices as timber lands. The rice, cotton and sugar lands net the owner at least $7.50 an acre annually after paying taxes and all other expenses. In fifty years the owner would get $375.00 off of each acre of his land, besides obtaining enough annually to pay his taxes; the land itself being worth $50.00 per acre, making a total of $425.00, plus the interest on the money made annually, while the timber owner could not get more than $120.00 per acre in the gathering of his entire matured crop, after spending a goodly fortune in building a plant preparatory to its harvest. Again, the cut-over lands are taxed practically their full value, thereby making it burdensome to carry them, much less to spend anything on them for the purpose of reforestation.

The effect of such laws is shown in the state of Michigan, where over six million acres have reverted to the state. A like condition, to a lesser extent, exists in other states. I find the Constitutions of several States permit them to exempt such properties from taxation; others permit them to classify; others to either exempt or classify.

And now we come to the vital point of the subject, namely: the conservation and perpetuation of this great resource. In dealing with this subject as it now presents itself to us, it becomes necessary to dwell on some features that directly and immediately affect the interests of the timber owners. Belonging to that class, we would refer to these features with some embarrassment, did we not feel it had been our purpose, in preparing these thoughts for your consideration, to treat them on broader and more patriotic lines than any exclusively selfish idea would permit;

besides, we believe the thoughts presented will appeal to you as eminently fair and correct, and will of themselves prevent your ascribing to us a selfish motive.

I want to give especial emphasis to the statement that conservation and perpetuation of our forests and unremunerative prices for lumber cannot travel the same road, for conservation means to handle, to treat, to take care of, and save in such manner as to retain the use or benefit of a given product as long as possible. Perpetuation of forests means to so exploit the forests as to make them continuous and perpetual, which can only be done by spending money continuously in planting, seeding, protecting, etc., while *low prices of any commodity means neglect and waste.* This cannot be more forcibly illustrated than by the conditions existing today, as applied to lumber; on account of the low prices now prevailing, the logs making low grade lumber, secured principally from that portion of the tree approaching the limbs, and constituting at least 20% of the forests, are left in the woods to rot or be burned, because the lumbermen would no more think of using the raw material out of which he could not obtain cost, than the farmer would harvest a crop of faulty corn out of which he could not obtain the cost of gathering.

This leaving of 20% of our logs in the woods,—as applied to the yellow pine industry alone,—if we market as much lumber this year as last, means that we will have wasted over 300,000 acres of forest land, and so, in order that the product of these low grade logs may take their place in the lumber supply of the world, and our timber saved or conserved, the manufacturer must at least have cost for his low grade lumber, which means a comparatively better price for the better grade; and this need not necessarily mean high priced lumber, but the price must be removed materially from the prices now prevailing, and such as we touch periodically, even in normally good times; for lumber is like every other product, controlled by supply and demand, and if we build mills with sufficient capacity to supply the demand of the country in times of extreme activity, such as we had in 1906 and the first two-thirds of 1907, we shall have capacity beyond our requirements in normal times, and under such conditions down go the prices.

On account of such varying and unstable conditions, it will be found difficult, if not impossible, to get the timber owner to enter actively into the methods required for the perpetuation of the forests by spending even the minimum required, which I understand to be about fifty cents per thousand. While this does not seem a large amount, there are concerns making as much as two hundred and fifty million feet of lumber per annum, and hence to these, the cost of this item would be $125,000 per annum. If his or its competitor was pursuing the same practice, all would be well; if not, he would, for the immediate present, be out that much more money than his competitor, and during dull periods, such as now, when prices were close to the cost line, even for the better grades of lumber, he would hardly feel disposed to contract for such an outlay.

The Government only owning about 22% of our forest area, cannot alone, to any great degree, effect what we are seeking in this Conference, so far as forests are concerned. It might however, accomplish the purpose in one of the following ways:

First. The Government could, by a contractual relation with the owners of the forests where lumbering operations are now being carried on (which constitute at least eighty per cent of the timber holdings of the United States) provide that conservation and reforestation should be practiced under rules prescribed by the Forest Service, and assess the cost thereof against the timber lands proportionately. These rules should provide that the lumbering operations, so far as conservation and reforestation were concerned, should be conducted under governmental control; that no more timber should be cut than was necessary to supply the current demands, thus maintaining such uniformity of prices as would justify the operator to utilize every log the tree would produce; that only trees of a certain size should be cut; that seed trees, properly distributed, should be left; that the young growth should be protected from fires and other elements of destruction, and it would seem clear that the establishment of such a relationship would certainly accomplish this highly desired object.

Second. A plan might be worked out jointly between the owners of the timber lands, and the Government, by which conservation and reforestation would be practiced along such lines as the Government might lay down, as outlined above, and the timber owners be protected in the prices of all lands cut over and handled under the conditions prescribed.

Whatever plan is adopted must furnish an incentive, a substantial inducement to the timber owner, to forego a present gain for the public good, and in this matter it can only be accomplished by governmental cooperation. And what is done should be done quickly, for the time is fast approaching when our forests will be so nearly gone that it will be too late.

Will the Government avail itself of this golden opportunity to lend its aid to the conservation of this splendid natural resource, in order to supply the timber for future generations; be wise and patriotic enough to provide for the inevitable result that must occur before the middle of the twentieth century, and thereby perform the true function of all good governments in the promotion of the health, wealth, and prosperity of the people? Or, with climatic changes following the destruction of our forests, shall manufacture die with them, and commerce fail as a natural result of agricultural and manufacturing decadence?

Disclaiming all partisan or political references, and speaking only of economic conditions as we find them, I do not think I should neglect to say that the present demoralizing conditions existing in our commercial and manufacturing life, and the consequent waste and loss incident thereto, and especially incident to the wasteful destruction of hundreds of thousands of acres of timber annually is, in my judgment, due largely to the pernicious effect of that class of legislation which, by its application, has placed an absolute prohibition on every form of agreement looking to conservation; has placed a ban upon all meetings and discussions having for their object the adoption of the most salutary measures for the preservation of this natural resource, and the instant and unfair denunciation of every meeting of the so-called "Lumber Trust," which does not and never did exist; has produced such a condition of mind among lumbermen, that they feel that they can no longer meet together for the general discussion of matters so vitally affecting their interests and the welfare of this Nation, without subjecting themselves to the humiliation of a prosecution. This condition in the lumber business has led to the reduction of the wage scale of hundreds of thousands of men, affecting many millions of people; it has left twenty per cent of the timber in the forest to waste; and unless we have relief, these evils will increase and others will follow in their wake.

Compulsory competition is our present commercial nightmare. Such competition is not healthy but disastrous, and serves only, in the end, to create the most pernicious monopoly by destroying all competition,—it means the survival of the *strongest* and not the "*fittest.*"

Is it not sufficient for all that our resources should be conserved and saved for all generations; is it right or just that a great industry should suffer, and generations to live hereafter be deprived of an adequate supply of lumber, in order that a prejudice be vindicated, and the consumer of today buy his lumber at less than cost?

And in this connection, it may be well to say that a reduction of our tariff on lumber would at once bring us into direct and disastrous competition with lumber from Canada, where stumpage is cheaper and wages lower, and where the consequent tendency toward wastefulness necessitates corresponding disregard on our part. Waste is loss, and adds nothing to consumption. We want greater consumption, but we should conserve and reproduce, not waste.

The part played by the United States Steel Corporation since its organization, in the maintenance of staple prices, while obtaining a profit and not improperly using its power, is a most substantial demonstration of the salutary effect of concentrated control of any commodity in the interest of uniform prices and conservatism, without injury to the consumer or harm to any one.

The American people have common sense, are patriotic and fair, and a full understanding of the real conditions confronting us, will appeal to their good sense and sentiment, and they will support any measure of true relief.

And now, Mr President, before closing, I want to say again, aside from the soil itself, this is the most important natural resource at the command of the American people today. It has its most intensely practical side, but is not by any means devoid of its sentimental side, the absence of which from human breast leaves one devoid of one of the most beautiful attributes of human kind. One that possesses this finer nature has said:

> "A tree is one of nature's words, a word of peace to man;
> A word that tells of central strength from whence all things began;
> A word to preach tranquillity to all our restless clan."
>
> "Ah, bare must be the shadeless ways, and bleak the path must be,
> Of him who, having open eyes, has never learned to see,
> And so has never learned to love the beauty of a tree."
>
> "Who loves a tree, he loves the life that springs in star and clod,
> He loves the love that gilds the clouds, and greens the April sod;
> He loves the Wide Beneficence; his soul takes hold on God."

I am happy in the thought of this Conference for the purpose of discussing this and kindred subjects, and shall hope that we may not rest satisfied in the thought that there is plenty for our day and generation, for such a thought means selfishness; selfishness means littleness. Anything that is small is prescribed by a very limited circle; and I venture the statement, that there is no place of comfort or happiness in the universe of God or the realm of man for such an individual.

The PRESIDING OFFICER (Governor JOHNSON): Before opening these matters for general discussion, I have been requested to make two announcements: Several of the Governors and their advisors have not registered; it is desired that they should register at the proper place. It also appears that some of the invitations to the reception this evening at Mr Pinchot's residence may have miscarried; if any have not received them, it is desired that they communicate with the Secretary, when the invitations will be delivered.

The papers are now before you for discussion. Before inviting general discussion upon these matters, I wish to say that the Secretary of Agriculture is on the stand, and I am quite sure the Conference will be glad to hear from him. [Applause and cries of "Wilson," "Wilson"]

ADDRESS BY HONORABLE JAMES WILSON

SECRETARY OF AGRICULTURE

Mr President, Gentlemen, Governors:

I do not think it wise for me to say anything here. I have been filling up, since you came here, and learning; and really you should do the talking and give us instruction. I am one of the servants of the People, anxious to know what is best to be done for the general good.

The paper read by Mr Hill this morning made a very deep impression upon me. The greatest asset we have in the United States is our soil, and we are destroying that as promptly as we can, and the oldest settled part of the United States has made the most progress in the destruction of that soil, [laughter] of which we have a great variety.

Down on the Gulf coast our people have lived longer than they have in the upper part of the Mississippi valley. They have heavy rainfalls down there, and the perpetual cultivation and the growing of hoed crops, have helped erosion, and the soil down there has been destroyed in that way. It is going off very, very rapidly. The remedy is a system of agriculture that will keep the soil filled with plant food, organic matter, humus; with other well known means. That is the cure; that is the way to keep up the soil. Somebody asked an English gardener how he got such a fine lawn; for he had a nice grass lawn which attracted attention. The gardener answered, "We weeded, and weeded, and we manured, and manured, for a matter of eight hundred years;" and that is the way they got it. [Laughter]

Now, jumping from one part of the United States to another—because I am going to speak but a very few minutes—the people in the grass belt in the Mississippi valley have ceased to grow wheat crops to as great an extent as they do in some other parts of the country. They grow grass; they are compelled to grow grass. The factory, the railroad, the mine and forest have taken away the farm help, and they are not able to compete with those industries in hiring men. So far as the poorer land is concerned, it is being abandoned and is going back to Nature; and Nature is good to it—if you give her time. High priced labor results in rich land being put in grass. Anybody in studying wheat, and looking into one of those States that at one time grew fifty million bushels, will discover now that they grow scarcely any. Why? It does not pay. Put wheat up to a dollar a bushel, and the State of Iowa will grow fifty million bushels a year. They will plow up the pastures and grow wheat. That is where the remedy lies.

The people of the southern States were not able to indulge in cattle management, because Nature has supplied them with an obnoxious tick down there, and it was not profitable; but the United States Government has set about destroying that tick, and will succeed. Those people will get pasture, those people will grow grasses, the grasses will fill the soil, erosion will cease comparatively; and when they want a great cotton crop they will plow up the soil, as the man in Iowa plows up the pasture to get a corn crop. [Applause]

Then go further west into what was known as the American desert, west of the one hundredth meridian. The Department of Agriculture hunted the world over for plants that grew in dry conditions like those, and among the deserts in Asia and Africa they found the plants that would grow there. They found a hard wheat; and we had quite an interesting time in getting it introduced, because the miller did not want to grind hard wheat; it took more power—but we heard of fifty million bushels of it last year. [Applause] It is the richest wheat that grows, there is more nutriment in it than in any other wheat. It is growing all the way from the Dakotas to the Pacific Ocean.

But you can not grow crops forever without legumes. Those people out there have rich land; the disintegrated rock out in that country has never been washed; the mineral plant food found in this disintegrated rock has not been carried away as in the southern States with floods of water, because they do not have floods of water. [Laughter] When the irrigation problem under my friend Newell, here, lets water on to land it will grow anything, because it is ready to produce anything, and is exceedingly rich. When you speak practically of the destruction of a soil it means that you have taken away that part of the plant food that comes largely from the atmosphere. That is what has been taken away; and good farming means the keeping of that supply of organic matter in the soil—that is simply what good farming means. It is well enough to apply fertilizer if your system of farming is such that you can not get a pasture. That is well enough; but the people in the Mississippi valley never have used fertilizers, and let me tell you they never will, because there is not fertilizer enough to be gotten in the market to supply all the American farmers. We have got to farm without it; and the people in the dry region are some day going to supply the cities of the East with wheat from that same dry region. [Applause] We sent men two years ago away up into northern Siberia to find legumes to grow in North Dakota. We knew they must be there, because man could not farm without legumes; and when we went there we found a clover that lived in the winter, with the thermometer six degrees below freezing; and we found new alfalfas, and also winter wheat.

Now all I can tell you is that we are going to bring these Siberian winter wheats here this summer, and take them out to the people west of the one hundredth meridian; and then those people will be ready to farm. [Great applause]

The **Presiding Officer** (Governor **Johnson**): We know that we have been travelling for one hundred and fifty years toward great prosperity. I think the two days we have spent together have indicated that the race in the future at least will have a great deal of trouble in keeping up. I think the Secretary has struck a very happy note in one thing; he has advised a remedy. He says that we have got to have something from the atmosphere for the enrichment of the soil. I know there are a number of men here in politics, and it seems to me that will give a number of politicians an occupation. [Great laughter and applause] If hot air is just as good as cold air, we know what the politicians in the future have got to do. [Laughter]

The papers are now open for general discussion. I am quite sure that this Conference so far has been a great success. If anyone here will give expression to one idea that will make someone go out in the wilderness and blaze a trail where he may find an opening, and be of some benefit to the human race, I am quite sure that will add to the value of the sessions.

I hope that, different from yesterday, the remarks of today will be germane to the various papers that have been addressed to the Conference. I trust also that anyone desiring to speak will, when rising, give his name and State, which will facilitate the keeping of the stenographic report of the proceedings.

The statements are now open for general discussion.

Governor **Folk**: Mr President, following the line laid down by the gentlemen who have spoken with reference to finding some means for enriching the soil, I would like to call the attention of the members of the Conference to a unique idea that is being carried out generally in Germany, and which will no doubt be applied in this country, especially in the preservation of our soils. It is a process, that has been long known in Germany, for taking nitrogen from the air and making it into fertilizer. The process is now being used in this country, and there is a gentleman present who can give us some information on that very interesting subject.

The **Presiding Officer**: It would seem that that would more properly come up in the program of tomorrow.

Governor **Folk**: There is an agricultural feature to it, and for that reason I mentioned it. I would like to have you call on the gentleman, who is present, and who is very familiar with the subject.

The **Presiding Officer**: The subject will more properly come up tomorrow, under the program; but if the Conference desires it we will take it up now.

It was moved and seconded that the consideration of the subject be postponed until tomorrow, and the motion was carried viva voce.

The **Presiding Officer**: We will now hear from Mr Whipple of New York.

Address by James S. Whipple

NEW YORK STATE FOREST, FISH AND GAME COMMISSIONER

Mr President, Governors, and Gentlemen:

The able papers that have been read by Mr Hill and others tell us of the danger of exhaustion and loss of our natural resources. It seems to me that the farm and forest must go hand in hand. Coal, once used, can not be returned. Iron, once used, can not be put back into the mountain. Oil and gas, once used, are gone forever. Then the most that can be done is to use them carefully, making each go as far as possible for our use. All of our natural resources are of great importance. They form the real wealth of our Nation; yet the greatest of these is the forest.

On the forest more depends than on any other one natural resource, any other one natural product. The water-flow of the Nation largely depends on the forest. The productive quality of our farms depend in a great measure upon our forests. Our waterways for transportation depend on our forests. Game birds and game animals depend largely on our forests; there is their home and breeding place. You tell us iron, coal, other minerals, gas and oil are rapidly giving out, yet no one has suggested a remedy except to be careful, and, indeed, it is all that can be suggested. Yet the forests can be protected, the waste places can be re-forested. This is the one great need of the present time. The future prosperity of our people depends on it because our farms depend on it; and from them, and from them only, can we obtain the things we live on.

Let us take New York as an illustration. We have more than 50,000 square miles of area, 32,129,920 acres. It is a rolling, hilly country, with broad valleys and great upland plateaus in the Adirondacks and Catskills and the foot-hills of the Alleghanies. From these uplands most of our rivers run. We now have standing about 41,000,000,000 feet of timber, board measure. Last year we cut off more than 1,300,000,000 feet. About 27% of our total area is covered with forests, good, bad, and indifferent. The State owns, of this woodland, more than 1,600,000 acres. That, under the Constitution, can not be cut. That amount must be deducted in the calculation. A simple mathematical calculation indicates that, at the rate we are now going, in about twenty-two years we will not have a sawing-stick left standing, except on State land.

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We have been told that our farms are growing less productive. What will they produce when the timber that protects the sources of water supply is gone? Is there any doubt about what the conditions will be? Is there any doubt about the fact that a country without wood and water is like a house without a roof—valueless and uninhabitable? Let me illustrate: Suppose that today by some great force in Nature every tree and shrub were swept away from the face of New York State, what would the condition be tomorrow? Would not chaos reign? The streams would be uncovered, the waters would dry up; God's reservoir under the trees on the forest floor would be destroyed; the farms would soon become unproductive, and in a year would shrink in value and in products at least half. The commercial supremacy of the State would be much injured, if not destroyed; and all on account of the loss of our forests. There would be raging torrents in flood-time, scattering destruction everywhere, and dry river-beds in the heated term of the year. Is there doubt about this? If you think so, then tell me why it is that the arid lands in the West, which can only produce cactus, will, when you pour some water over them and plant a few trees, nourished by the water, blossom like a rose? If it is not true, tell me why lands in China, once very productive, are now worthless since the trees have been cut away? If it is not true, tell we why the Valley of the Euphrates, once beautiful and productive, is today a howling waste, merely because the forests have been destroyed?

In the State of New York there are great natural opportunities for generating power by the conservation of the waterflow. Outside of the river Niagara and the St. Lawrence, there is at least 550,000 horsepower, with 450,000 now developed. This furnishes an opportunity for the investment of great sums of money and the employment of much labor; but yet, what will be the use of building great storage reservoirs on the Hudson, the Genesee, the Allegany, or the Sacandaga unless the forests are preserved, and thereby a constant flow of water is kept coming from the springs on the mountain tops and the hillsides to supply the larger streams tributary to these great rivers? Without forests, much of the power of the inland rivers of the State will be destroyed. Forests can be restored. That is the problem of the hour. You say the coal is going, and do not tell us how to replenish it. We all say the forests are going, and I tell you how to save them, how to restore them. Save them by setting aside a forest reserve; restore them by planting trees. A tree crop can be raised as well as an oat crop. It takes longer; that is all. It is profitable business, once understood. Shall we, the supposed most intelligent people in the whole world, stand with folded hands and do nothing of importance to save and restore our forests? Shall we sit supinely by and allow total destruction to take place in this respect, when we have the history of Germany, France and Switzerland for a thousand years, teaching us the lesson? The most imperative duty of America today is to save the forests of this country. [Great applause]

The State of New York, as a State, has planted more trees than all the other States, and yet it is a mere drop in the bucket. I do not speak of what the State has done with much pride. I rather speak of it with regret that we have not done more. This year we have planted 1,100,000 pine and spruce trees; it should have been 20,000,000 instead. It is all a matter of education. We must go among the people and show to them the necessity; they will respond. Every farmer should plant trees on the vacant places on his farm that are not good for agricultural purposes. [Great applause] Every individual should plant trees. The cut in the United States is at least four times the amount of reproduction; the end is in sight unless we all plant trees.

Very largely the condition in New York is the condition in all the States. The forests are going. We should cut ripe trees, burned timber, down timber, saving the smaller saplings and some seed trees for future growth and future seeding. In addition to that, we must plant the cone-bearing trees, as they do not, in most places, readily reseed. Hardwoods will replenish themselves, but the cone tree seldom does so in commercial quantities. We must encourage individual efforts by furnishing trees free, and by relieving land dedicated to tree-growing from taxation; at least from increased taxation. These are the things that are happening; these are the things that must be done. Until this country plants trees and protects forests, as Germany does, we will not be safe; when this is done we shall be safe in that respect in America in the future. [Great applause]

The **Presiding Officer**: It has been the general impression that New York has been exhausting the energies of the People of America for a long time; and I am glad to know that they are putting something back into the soil.

Governor **Brooks**: May I ask Mr Whipple if that work was not done entirely under the supervision of the State Forestry Commission?

Commissioner **Whipple**: Entirely under the charge of the State Forestry Commissioner.

Governor **Brooks**: How long has the forestry service of the State Government of New York been in existence?

Commissioner **Whipple**: Eighteen years.

Governor **Brooks**: In the estimate of timber, is it not a fact that in the Adirondacks many sections have been cut over already three different times?

Commissioner **Whipple**: I am simply stating the fact about it; it is not a question of estimate. No section has been gone over three times, except to pick up the tops. Some of it has been cut over twice.

Let me call the attention of the Gentleman to one other thing. A cone tree in America can never, by natural causes, re-seed itself commercially. The hardwoods will reseed; but the tree which bears a cone must be planted artificially. The planted tree, or the replanted tree put into the forest, will grow in height twice as fast as the natural seed tree of the forest, because we get a larger root-growth every time we transplant it. It is the most profitable business tree that a man can invest his money in, and it will pay twice compound interest to any man who will invest his money in it.

Governor **Brooks**: I am very much interested in the Commissioner's remarks relative to the work being accomplished by the State of New York in protecting and preserving forests and in reforestation. I have followed the reports of the State Forestry Commission rather closely, and I was under the impression that during Governor Flower's administration it was stated, in those reports, that certain sections of the Adirondacks had been cut over three times; the trees being limited, of course, to twelve inches in diameter, and from that up.

Commissioner **Whipple**: They have cut off every green tree upon the slopes of the Hudson, and erosion is taking place today. It has not been cut over three times; and yet we are importing 85% of our wood for paper from Canada. I think we are using 300,000,000 feet from the Adirondacks alone.

The **Presiding Officer**: Let me make a suggestion: It has occurred to me that probably a great many Conferees would like to ask questions with reference to this subject. Why not submit them in writing and let Mr Whipple answer them at some future session?

Commissioner **Whipple**: Mr Chairman, there is just one further suggestion I want to make, and it is this: We have put upon the statute books a law exempting land dedicated to tree-raising from taxes. [Great applause]

The **Presiding Officer**: Governor Fort is called for. [Applause]

ADDRESS BY JOHN FRANKLIN FORT

GOVERNOR OF NEW JERSEY

Mr President and Gentlemen:

New Jersey may not seem to be a State that would naturally be interested in forestry, but it is. Forty-six per cent of our State is woodland, old as we are, coming in as we did at the beginning of the Republic, and expecting as we do to remain until the end. [Laughter] We have a State Forestry Commission that is doing splendid work.

We have purchased in New Jersey 10,000 acres of land within the last three or four years, land that we could pick up for this purpose, to conserve it as a forest reservation. We appropriated this year in the legislature $25,000, a reasonable amount for a small State, for the continuance of the purchase of land for forest reservations in New Jersey. That means that we will be able to purchase probably five or six thousand acres during the present year in our State. We have agreed with those townships and localities of our State where this forest land lies that we will pay them from the Treasury of the State of New Jersey two cents an acre on taxes for every acre of land that we take from the locality out of their tax ratables. [Applause]

We have endeavored to do another thing; we did not succeed with the legislature this year, but I think we will succeed a year later: We are establishing fire lines along all the railways of the State, opening a lane of ten feet a hundred feet from either side of the track; and we provide that the man who will not permit us to do that through the forest land of New Jersey shall not have any action against the railroads for damages, [laughter and applause] and if he will permit us to do it, and fire results, then he has his remedy, as he has now. The object of that is, as you will see, to protect the forest lands of our State. These lands mean a great deal to us, situated as we are along the Atlantic Coast.

A CONFEREE: You have not done that yet?

Governor FORT: We expected to do it this year, and we came very near doing it. I think it was an oversight rather than through opposition that the bill failed of passage.

We do not expect large results in the way of lumber industry in New Jersey. The present output in our State is about $2,000,000 a year, which is small compared with your great western States where you get such enormous revenue from this great industry. But we believe that by educating our people on this line we can increase the industry to at least $6,000,000 a year in a very short time; and in addition to that we want to educate the people to conserve the forest lands of our State. You know we are situated where you all come for almost all the pleasure you get in this world. [Laughter] We have this magnificent water of which we shall all speak tomorrow, and the splendid sea-coast; and now, what we want to do in New Jersey is to preserve our forests, to protect them, and to build them up, if we can, and I guess we can, because we have sufficient financial ability to do it without very much trouble to our People in the way of taxation; because you know we have no State tax in New Jersey, of any kind, and have not had in twenty-five years.

Let me say to you that we propose to go on; and if we succeed, we want to make these forest reservations (as Dr Kümmel says on a

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memorandum which he has just handed to me) the playground for the People of our State, and the People of the United States who come to us along the New Jersey coast. You only have to run about three miles back from the sea to strike the ridge of the pine land. If you go to Lakewood you are right in the midst of the pine hills, in the vicinity of which we have purchased 5,000 acres in the present year. We will bid you welcome to the forest reservations we intend to establish, as well as to our beautiful sea-coast, to which you all delight to come. [Applause]

In addition to their direct value, we of New Jersey appreciate our forests as conservers of our waterways; and being called away unexpectedly, I ask your consideration of a few facts and figures (forming part of the Secretary's record):

The progress of our Nation depends on its commerce. It is recognized universally that the germinal principal of commerce is transportation. I believe the most important problem which confronts us as a Nation as the efficient and economical distribution of our products, in the correct solution of which is involved not only our immediate prosperity but our future well-being and national greatness.

It is everywhere and by everyone admitted that the railroads of this Nation can not successfully cope with the problem of the transportation of our interstate commodities, our natural and manufactured products, our exports and our imports.

Railroad construction has been overtaken by the development of our industries, and the Nation as a whole has suffered by reason of the inability of our railroads to keep step with our rapid industrial growth.

Measured in ton-miles, freight traffic in this country has increased over 400% in 20 years; and of the total estimated wealth of the country, railroad freight charges amount to the stupendous figure of 1½%.

It is apparent to every student of the times that additional facilities for transportation must be provided if we are to maintain our commercial supremacy.

To illustrate graphically these facts, note diagram 1, which shows to scale the tonnage carried by steam roads in the United States each year from 1882 to 1906, and also the passengers carried during the same period; diagram 2, showing the increase in value of manufactured products in the United States for each year from 1882 to 1906, and immediately below the mileage of steam railroads in the United States for the same period; and diagram 3, showing the freight passing annually the Sault Ste. Marie canals from 1888 to 1905, which illustrates what one single canal improvement has accomplished.

James J. Hill, that master workman and constructionist of the Northwest, states that our railroads are inadequate to meet the demands made upon them. In a speech at Kansas City in which he gave voice to his opinion—an opinion of a man whose life work has been devoted to the solution of the problem of transportation by rail—he said:

> The transportation facilities of the whole country are and have been unequal to its present needs. They must be made equal to the burdens they bear, or the country can not prosper.
>
> A year ago I said it would require $5,500,000,000, or $1,000,000,000 a year for five years, to make our facilities equal to the demands upon them. Although substantially the amount of money suggested by me as indispensable has been collected and spent, the railroads have barely held their own, and the future remains to be provided for. Not less, but in the opinion of competent judges, more—perhaps 50% more—must be spent annually for the five years to come.

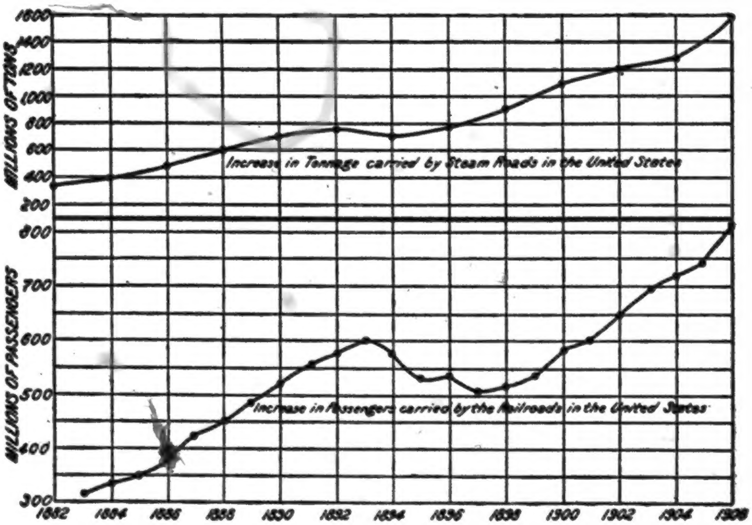

Diagram 1

It is then apparent that we can not anticipate immediate relief from the railroads and we must look elsewhere for a remedy. As a nation we can not stand still; we must obey the immutable law of progression or retrogression; we can not go backward; we must go forward; and the relief we seek is at our very hands. Overlooked for years, save by the sagacity of the few to whom we owe the creation of the Inland Waterways Commission, we now recognize that in the great primal scope of things our waterways were meant to serve as highways for our commerce and to provide interstate communication.

An examination of every map of the United States will reveal that navigable rivers and lakes traverse our lands from the East to West, and the North to the South. No other Nation the world over can boast of such an abundance of natural waterways.

The development of the waterways of the country is one of the most commendable projects undertaken by the National Government, and one which will materially add to the commercial advancement of our country.

The marvelous growth of our country has been made possible solely through the energy of the men whose skill has consummated the greatest railway systems ever known to the world, to whom we must rightfully attribute much of our material success.

It is but natural to assume that in extending the railway enterprises of our land many mistakes have been made; on the other hand it would be supernatural if errors had not ensued.

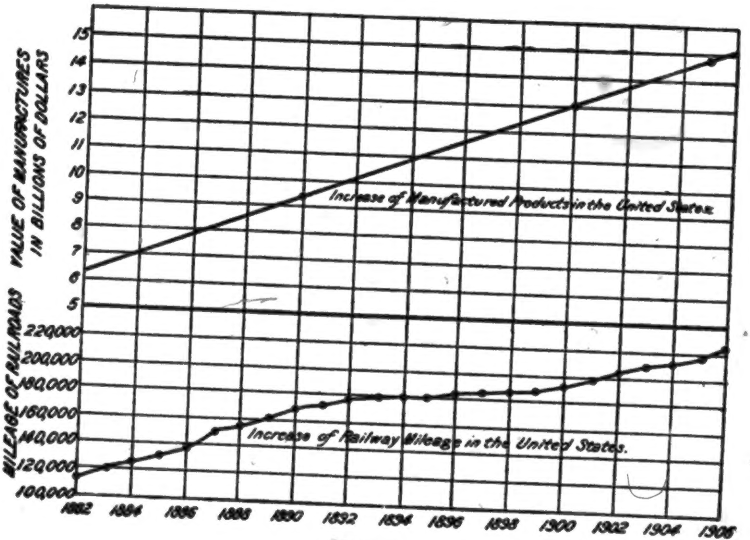

Diagram 2

For the past thirty or forty years most of the brains and skill of our brightest men, together with their capital, has been invested in the creation of utilities for public service; first, in the construction of extensive steam railway lines; second, in the creation of street railway projects; and, third, in the local development of water powers for the production of heat, light, and power. So much has this been so that, with few exceptions, the American Nation has lost sight of the commercial importance of its waterways.

Twenty-six hundred miles of artificial waterways have been sacrificed to the cupidity of short-sightedness, and now that the public, including the railroads, realizes that our Nation has expanded in such a measure that we can not be served by existing traffic arrangements, and our exigencies demand an auxiliary medium of transportation, the entire country is aroused to the desirability of so improving our internal waterways, both natural and artificial, that the same can be utilized for purposes of commerce.

We of New Jersey believe in conservatism; however, not in the conservatism the synonym of which is the expressive phrase "do nothing;" but rather the conservatism which finds its real definition in the word "caution."

I strongly advocate the rehabilitation and utilization at moderate expenditure of such of our artificial waterways as are not beyond redemption. This would afford immediate relief to our facilities of transportation and would involve but nominal expenditures. I believe this work should be undertaken as expeditiously as possible and that the Executives of the several States in which these artificial waterways are maintained should lend their energies and their influence in this behalf.

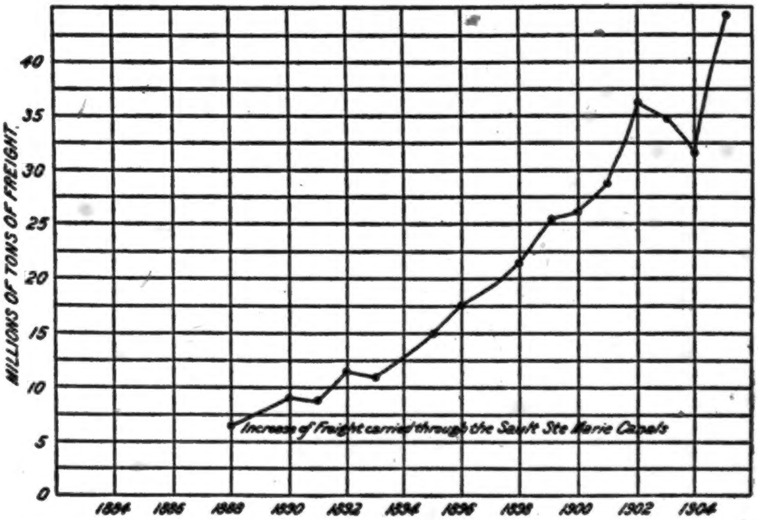

Diagram 3

The creation of additional deeper waterways is a stupendous undertaking, and we should profit by the lessons of our past experience and not essay too much without deep study and careful investigation, particularly in view of the additional strain which it would entail upon our financial resources. I believe it would be advisable that each State create by legislative enactment a Waterways Commission, composed of engineers of recognized ability and public spirited men of large affairs, to carefully investigate the conditions and necessities of each State, to make the necessary recommendations and outline a concrete plan to be followed by each State within its borders, or by the Federal Government, as may be decided upon after due consideration of the legal questions involved and the determination of the status of all the parties at interest in this important matter.

The problems before us possess many ramifications, and our plans, to meet with the success they merit, must be comprehensive and must include provision for all the co-related phases of this subject—the preservation of our forests; the reclamation of our swamp lands; the irrigation of our arid lands; the protection of the banks of our streams; the clarification of their waters, and other related matters; and I am of the firm conviction that ultimately every means of transportation of our railways and our waterways will be coordinated, and I believe that any plans we may here evolve should have the eventual coordination of our transportation facilities in view.

As the Executives of each State will present to us in this Conference information pertaining to their local conditions, I shall therefore confine myself to the two subjects of first importance to the State of New Jersey, of which the greatest is Water Transportation and the next Forestry (on which I have already spoken).

I—OUR IMPORTANT GEOGRAPHICAL POSITION AS A GATEWAY FOR INCOMING AND OUTGOING TRAFFIC

New Jersey occupies a strategic geographical position with reference to the New England, Southern, and mid-Western States.

Situate between the great metropolis of the State of Pennsylvania and New York, the greater metropolis of the Nation, its southwestern shores form a part of the Philadelphia harbor while its northern shores form a part of the New York harbor; and it also lies between the great anthracite coal mines and the iron and cement fields of the Lehigh valley, and tide water.

With its Hudson and Delaware rivers and Newark and Raritan bays it furnishes safe and protected anchorage for vast fleets of vessels, and from these bays barges could pass through its rivers and inland natural and artificial waterways to every important city of the State.

Through the use of its own waterways and canals, in conjunction with the Lehigh canal which lies in Pennsylvania along the western shores of Delaware River, New Jersey is the gateway to tidal water for the anthracite coal fields; and transportation by water is practicable, in conjunction with Delaware River and the Chesapeake and Delaware canal, for the bituminous coal of the West Virginia fields to all its manufacturing cities.

With these water facilities made available, water transportation to all its manufacturing cities and the tide-water becomes open to the great cement fields and pig iron of the Lehigh Valley, and to the incoming iron ore from Cuba and the Northwest, lumber from the South, clay and all heavy bulk material used for manufacturing and building purposes within the State. In like manner its natural and manufactured products can be shipped to tide-water, from whence they can be distributed to the whole Atlantic coast and by Hudson River and Erie canal to the Lake Region and the Northwest.

An inspection of any map which shows the canal systems leading in all directions from the anthracite coal fields and across the State of New Jersey to tide-water will clearly illustrate New Jersey's position.

The total production of anthracite coal from the Pennsylvania coal fields in 1906 was approximately 71,000,000 tons, valued at $132,000,000 at the mines. Of this amount over 62,500,000 tons were shipped from the anthracite fields. The principal roads over which this coal passed are as follows:

	Gross tons.
Philadelphia & Reading	18, 241, 512
Lehigh Valley	9, 971, 699
D. L. & W. R. R	9, 201, 875
Erie R. R	5, 636, 537
Delaware & Hudson	5, 346, 695
Pennsylvania R. R	4, 856, 004
New York, Ontario & Western	2, 444, 273

The total exports from the United States of anthracite coal were 2,216,969 tons, valued at over $10,800,000. The amount of anthracite coal shipped to the port of New York (which includes the Jersey shore as well) and re-shipped from that port was 12,739,518 tons, while the anthracite shipments to Philadelphia were 5,622,137 tons, and to Baltimore 707,425 tons. This tends to show the heavy movement of anthracite coal from the coal fields to the sea ports and indicates the movement of this commodity across the State of New Jersey.

No records are available showing the anthracite coal consumption in New York City and surrounding communities, but estimates by men of long experience in the coal trade place this consumption at from 15% to 25% of the total anthracite output. The greater part of the coal re-shipped from the Port of New York goes by coal barge or sailing vessel, and in the absence of a continuous inland waterway paralleling the coast there have been many and serious losses of these coal-carrying vessels, especially among the barges. One of the great advantages in the shipment of coal in barges by canal from the fields will be the saving in re-handling of coal, as with the completed scheme of inland waterways this coal can go directly in the original bottoms to ports on the New England and Southern coasts as well as the Port of New York

The cement manufacturers in the Lehigh valley, which occupies practically the same position with relation to New Jersey as the anthracite coal fields, produce annually almost one-half of the portland cement produced in the United States; the total production in the United States in 1906 being 46,463,000 barrels, of which 22,784,000 barrels were produced in the Lehigh valley. The average value of the cement manufactured in the Lehigh district for 1906 was $1.00 per barrel, or a total of $22,784,000. This immense tonnage is tributary to the railroads and canal systems crossing the State of New Jersey, and would find its natural Eastern outlet through the ports of New York and Philadelphia. The important part which cement plays in almost all types of building construction today makes the cheap transportation of cement a matter of vital importance to the whole country.

II—NEW JERSEY AS A MANUFACTURING STATE

We are preeminently a manufacturing State, and in many industries we lead the Nation—notably in the silk industry and in the smelting and refining of copper, in both of which New Jersey ranks first, and holds second rank in the production of pottery, terra-cotta and fire-clay products, and fourth rank in the jewelry and glass industries. Other large industries are slaughtering and meat packing, chemicals, electrical machinery, foundry and machine shop products, leather tanning and finishing, malt liquors, bread and other bakery products, and petroleum refining.

The total number of manufacturing establishments in the State in 1905 was 7,010, representing an invested capital of $715,060,174, employing an average of 266,336 wage earners, and using raw materials to the amount of $470,449,176, from which are produced finished products valued at $774,369,025. These establishments have installed and in use a total of about a half million horsepower, of which over 78% is steam power.

III—OUR WATERWAYS, INTERCOASTAL AND INLAND

The extent and condition of the waterways of New Jersey, intercoastal and inland, natural and artificial, is briefly summarized in the following statement:

New Jersey has an outer coast-line water frontage of 260 miles, and possesses acres of harbor anchorages where vessels of the deepest draught may float. We have 119 miles of navigable rivers and 172 miles of canals. None of the latter have been actually destroyed, but all are in the possession of private corporate interests.

New Jersey is served by the Hudson, Passaic, Hackensack, Raritan, Arthur Kull, and Delaware rivers, and by the Delaware and Raritan and the Morris and Essex canals; supplemented by the Lehigh canal, which, though situated in Pennsylvania, also operates to serve our State.

The mean depth of the rivers and bays is as follows:

	Feet.
Raritan river, from New Brunswick to Raritan bay	19½
Raritan bay (Channel)	21
Arthur Kull	19½
Kill Von Kull	26
Newark bay	6½ to 33
Passaic river, from Newark bay to Newark	9
Hackensack river, from Newark bay to Hackensack	11

The canals enumerated were primarily built to serve the anthracite coal trade, on which their prosperity was dependent. However, with their control vested in corporate railroad interests, which ruled their affairs with an iron hand, they have practically passed into disuse.

The most important of these artificial waterways is the Delaware and Raritan canal, which, I believe, offers the best route for the proposed Atlantic intercoastal waterway development. Connecting the Amboys on the east with Bordentown on the west, and serving the industrial cities of Trenton and New Brunswick, it affords an efficient and economical channel for commerce passing between the ports of New York and Philadelphia. This canal from 1867 to 1874 carried an annual tonnage of over 2,000,000. It was acquired by the Pennsylvania Railroad in 1871, under lease at an annual rental of 10% on its cost, which amounts to $584,740 per annum. By reason of the high tolls charged and diverting freight from the canal under railroad control, the tonnage has decreased, so that at the present time it has fallen to an insignificant amount, not in any wise sufficient to pay its operating expenses, to say nothing of meeting its annual fixed charges.

With proper engineering determinations followed by sufficient improvement and development, I believe this canal would be capable of showing large profits on any investment which might be made in this property.

The Morris and Essex canal connects the State of Pennsylvania with tide water. At Easton it joins the Lehigh canal, which has its source in the great anthracite coal fields, and extends 102 miles, passing through the most fertile fields of New Jersey, serving Phillipsburg, Port Morris, Oxford Furnace, Boonton, Paterson, Passaic, Newark, and Jersey City. The total tonnage of this canal advanced from 554,034 tons in 1858 to 723,927 in 1864, while the coal tonnage advanced from 350,331 in 1859 to 459,175 tons in 1866. In 1864 the profits of this canal enabled the declaration of a dividend of 10% on both its preferred and common stock. In 1871 this property was acquired under lease by the Lehigh Valley Railroad, for which an annual rental of 10% on the preferred stock and 4% on the common is paid. The cost of this property was $6,000,000. Immediately after 1871 the tonnage began to decrease rapidly, so that the last published records show that in 1902 the tonnage was 90,606, and its utility for transporting coal throughout New Jersey to tide water has been practically destroyed.

It is problematical whether this canal can be resuscitated and developed into a paying proposition. A careful examination by competent engineers will evidence whether this can be accomplished or not.

The great demand for increased dock facilities in the Port of New York has aroused much attention. An investigation of the possibilities of the utilization of Jamaica bay, Long Island, has been made by a commission appointed by the Mayor of New York city. Many difficulties would be met in the preparation and maintenance of a proper entrance to Jamaica bay which would not be encountered in the development of Newark bay and the lower reaches of Passaic and Hackensack rivers. The importance of developing this latter waterway can hardly be estimated. One of the most desirable features of its improvement would be the connection afforded between the water front and the great railway systems which have their termini in this State, and which could easily be obtained on reclaimed meadow land contiguous to Newark bay.

The experience of the city of New York in the matter of dock improvements points very clearly to the great importance of immediate action by the State of New Jersey toward the acquisition and control of any improvements contemplated either on Newark bay or on the lower Passaic and Hackensack rivers. New York first allowed the improvement of its water front to be accomplished by private interests, and has since seen its error. Heavy expense has been entailed to the city of New York in acquiring at this late day the water front required for the conduct of its affairs which might have been secured at a nominal cost before improvements were made. In fact, the major portion of these rights were originally vested in the State and city but were allowed to pass into the control of private interests, necessitating their reacquisition by the city.

I believe the Federal Government should co-operate with the State of New Jersey in the development of this important territory. This is unquestionably the most efficient, economical and expeditious manner of affording relief to the Port of New York, which together with improvements at the mouth of Raritan river, and to Arthur Kull, between Staten Island and the Jersey Shore, and to Kill Von Kull, which affords direct communication to the Upper Bay of the New York Harbor, a direct water channel will be provided from the Port of New York to Raritan river; and with the proper development of the Delaware and Raritan canal and Delaware river, a most important link of the proposed Atlantic and inland waterway would be effected.

IV—OUR LARGEST CITIES; THEIR PRODUCTS AND THEIR LOCATION RELATIVE TO WATERWAYS

Cities	Manufacturing products, annual value	Waterway	
		River	Canal
Newark	$150,055,227	Passaic	Morris.
Elizabeth	29,300,801	Elizabeth	
New Brunswick	8,916,983	Raritan	D. & R.
Hoboken	14,077,305	Hudson	
Jersey City	75,740,934	Hudson	Morris.
Trenton	32,719,945	Delaware	D. & R.; feeder to D. & R.; Del & Pa.
Camden	33,587,273	Delaware	
Bayonne	60,633,761	Newark bay	
Passaic	22,782,725	Passaic	
Paterson	54,673,083	Passaic	Morris.
Phillipsburg	6,684,173	Delaware	Morris; Del. & Pa.
Perth Amboy	34,800,402	Raritan, Arthur Kull, Raritan bay.	

V—OUR TRANSPORTATION PROBLEM; COMPARISON OF COST OF WATER AND RAIL TRAFFIC

In making any comparison of the cost of transportation by water and rail, we must consider transportation as applied to navigable rivers and deep waterways such as oceans, bays, sounds and estuaries, as separate and distinct from transportation as applied to large and small artificial waterways and canals and canalized rivers; as the depth of water governs the size and tonnage of vessels, which of course also govern the cost.

That the cost of transportation by water in large vessels or deep waterways has proven to be cheaper than transportation by rail is uncontradicted; so that a comparison need only be drawn between the cost of transportation on canals and navigable rivers and the cost of transportation by railroads.

The average cost per ton-mile of moving freight by rail in the United States is about six mills.

Taking a tonnage of 3,000,000 (1,500,000 east-bound and west-bound) per season of 270 days, on a canal similar to the Delaware and Raritan, at a speed of 3½ miles per hour, operating 24 hours per day, including all charges, interest, maintenance, etc., but not including cost of lockage and maintaining the canal proper (the figures having been arrived at from electric operation of the Lehigh canal at Mauch Chunk during five months of 1907, by tests of electric haulage on Erie Canal in 1905, and from the report by Sympher, Chief Engineer of Canals and Waterways of Germany, assisted by Engineers Thiel and Block, as given to the German Government on haulage for the Rhein-Weiser Canal), the estimated cost per ton-mile = $2\frac{3}{16}$ mills.

To this must be added toll charge to cover expense of employees to maintain and operate locks and canals, as well as taxes and interest on value of property.

As an illustration of the economy in water transportation as compared with rail transportation, let us take the pounds pull exerted in moving a freight train of 25 cars weighing 500 tons loaded with 1,000 tons of coal, giving a total weight of train of 1,500 tons. We find that it would require a locomotive weighing over 100 tons to properly handle such a train on level track. We further find that the pull exerted to move this train at a speed of four miles an hour is about the same as at twenty miles per hour; i. e., the pull is higher at the slow speed and decreases until a speed of about ten miles per hour is reached and then increases again as the higher speeds are reached. We find that this engine exerts a draw-bar pull of about 12,000 pounds in hauling this train.

On the other hand, take a cargo of 1,000 tons in two of the large modern canal barges weighing each 100 tons and giving a total load of 1,200 tons in boats and cargo. We find that the pull necessary to move this combined load of 1,200 tons at a speed of 3½ to 4 miles per hour on a canal of fair dimensions would be only 4,800 pounds, which it will be noted is only a little over a third of that exerted by the locomotive. This economy is due to the less resistance in the movement of boats through water; also to the fact that the weight of the boats is very much less than the weight of the cars—that is the dead load is less for the same cargo carried. This comparison is best illustrated to the mind when one thinks of the small electric adhesion tractor, weighing only about three tons, as compared with a mammoth 100-ton locomotive; the former hauling a 1,000-ton cargo by water, the latter a 1,000-ton cargo by rail.

VI—THE MODERN METHOD OF CANAL OPERATION

In this country but little has been accomplished to improve the method of propulsion on our artificial waterways. Excepting an extremely small percentage operated by steam, the same method of propulsion as existed in 1800, viz: the mule, has continued in operation up to the present date. The Old World has much to teach the New in the improvement, development, conduct and utilization of inland waterways as a useful auxiliary to its existing railways.

I will not recite at length the experience of France, Germany, Belgium and Holland in the creation and conduct of interior navigation, even though I have no doubt such a recital would contain data of great value to this Conference. All the data can, however, be obtained from the Consular Reports. It is sufficient for me to call your attention to the fact that in strong contrast with our policy in this matter in the past, t[illegible] French and German Governments, recognizing the importance of aiding in the development of their interior waterways, have rendered financial assistance not only in the construction and betterment of these utilities, but also in making tests of the different methods of propulsion. These tests, which have been made by eminent engineers who have been officially engaged in this work, lead up to the following conclusions:

1. Barges operating with their own motive power show a much poorer economy than barges being towed.
2. Barges with storage battery show the least favorable results.
3. Towing by steam tugs or electric locomotives show practically the same economy. However, with the increase of traffic, electric towing costs decrease, while the cost of steam towing remains constant.
4. The question of prompt loading and unloading is very important in the saving of day-time on barges. With electric haulage installations, the available electric power furnishes cheap and convenient motive power for the operation of loading and discharging apparatus, and also for the operation of locks and elevators, thus decreasing the idle time of barges.

From these conclusions it is apparent that we, too, must look to electric power for the successful operation of our canals and canalized rivers. It is apparent that in order expeditiously and economically to handle the immense tonnage which may be expected if our canals are operated under the liberal policy as advocated by this Conference, their electrification must ensue. But, until this greater traffic is developed, it will be necessary to provide a modified and cheaper form of installation to profitably carry the tonnage of the first few years until its increase will warrant the heavier carrying charges incident to the installation of electric motive power.

To attain this end an adhesion tractor operated by a gasoline motor has been developed in this country which will operate on the same mono-rail track as the electrically operated tractor, so that when the traffic of the canal has reached a volume sufficient to justify its electrification, the electric motor may be substituted for the gasoline motor without any further change whatever in the installation. Practice indicates that when the traffic is below about three-quarters of a million tons annually, a gasoline tractor will prove a more economical installation; whereas, for tonnage in excess of these amounts an electrically operated tractor is unquestionably more economical and efficient.

VII—OUR BOARDS OF TRADE, CHAMBERS OF COMMERCE AND KINDRED ASSOCIATIONS

The question of Inland Waterways has aroused the interest of the entire State of New Jersey. The rapid growth and development of our industries during the past few years and the commercial prosperity we have enjoyed have prompted our State and municipal officials and trade organizations, as well as our leading men of affairs, to advocate the improvement of our waterways. New Jersey is a unit on this question.

A great variety of solutions has been offered, and others are being planned, which, if carried out, will eventually make our State a network of waterways.

We have in our State a Rivers and Harbors Congress modelled after the National Rivers and Harbors Congress, which will serve to concentrate all the influences at work within our State into one working organization. The New Jersey Congress has been organized so as to provide for one vice-president from each congressional district, while the Board of Directors is comprised of representative men of affairs.

In the conduct of this association, it is arranged that each congressional district through its representative shall report on improvements desired, and, if after investigation it is determined that the improvements requested will produce beneficial results, the Rivers and Harbors Congress will lend its endorsement and assistance. This Congress does not purpose favoring any particular locality, but rather the intention is to work on broad and comprehensive lines for the best interests of both State and Nation. It is hardly necessary for me to say that this plan is meeting with the universal approval of the citizens of New Jersey.

The work which is being planned to develop the waterways contiguous to the city of Newark—the manufactured products of which cover every field of industrial endeavor—is worthy of special mention at this time. Working in harmony with the Board of Trade, the Board of Works of Newark purpose the construction of a ship canal in the meadows contiguous to Newark bay, which will serve to reclaim and develop this now practically useless swamp land. From an industrial point of view, the provision which is being made for a series of meadow terminals, with manufacturing adjuncts, is perhaps the most important matter now receiving attention in our State. There are four ways of utilizing the meadows:

1. Terminals for railroads
2. Terminals for steamships
3. Warehouses at these joint terminals
4. Manufacturing sites on the land adjacent thereto

In connection with this undertaking, the construction of a ship channel from Newark bay to Hudson river, which work is now being done by the United States War Department, will operate to make the waters of the Newark bay accessible to the shipping of the world.

Still another waterway improvement to which I feel your attention should be called is that of the construction of a tide-water way from Manasquan inlet to Bay Head. Surveys of this waterway have already been made. This improvement will create a harbor at Manasquan inlet and provide a waterway from this point to Cape May. The desirability of this improvement in connection with the Bay Head-Cape May canal is evident to all who have any knowledge of the New Jersey coast. New Jersey appropriated $300,000 for this improvement at the session of the legislature just ended.

But a few short years ago the coast line of New Jersey from Sandy Hook to Cape May was a series of barren sand-dunes and land-locked waterways. With no financial assistance from the State, the enterprise of our citizens has created seashore resorts at which an annual expenditure of many millions of dollars is made by the citizens of this Nation who visit these resorts in search of health and recreation.

VIII—RECOMMENDATIONS

I believe this Conference should use the utmost deliberation in outlining the policy to be pursued, and that we should plan with great care, with the knowledge that whatever we do at this time will affect the future material welfare of our Nation; therefore—

I recommend that each State having water facilities within or contiguous to its borders should appoint a Waterways Commission, in which engineering ability should predominate, to carefully investigate and make physical examinations of existing waterways, and, after consultation with the State organizations for waterway improvement and the various boards of trade and commercial bodies, to arrive at some definite conclusions upon which to recommend plans for improving these waterways, either as feeders to, or as component parts of, the contemplated deeper waterways plan which has been outlined by the various commissions in the past and by the present Inland Waterways Commission. Immediate action is earnestly recommended in this matter.

Governor **Woodruff**: Mr President, we have in Connecticut a University which is advancing forestry interests; it has a Department of Forestry. We have here with us today its president, Professor Hadley [applause], and I am sure he can tell you something in reference to what Yale is doing for the interest of forestry. I should like very much to have the Conference hear from Mr Hadley. [Applause]

ADDRESS BY ARTHUR T. HADLEY

PRESIDENT OF YALE UNIVERSITY

Mr President, Gentlemen:

When we first started our forestry school at Yale, eight years ago, things looked darker than they now look. It did not seem as though there was any interest in forestry at all. We worked with Mr Pinchot, here in Washington, and acting under his advice developed a school which should not only teach forest botany, but which should teach forest economy, and forest economy adapted to American conditions. [Applause] Our fear in the establishment of that school was that there would not be demand enough for the graduates. The numbers have increased until now we are sending out each year from thirty to forty men, trained in the actual business conditions of American forestry, besides giving instruction in summer to a large number of practical forest men in certain of the theoretical parts of the work. The growth of demand for these men has been so unexpectedly rapid that I feel sure that if this assembly can manage to tide over the dangerous time of the next twenty years, after that the thing will take care of itself. The people will get such new conceptions of forestry and of the demand for lumber that, on mere business grounds, forest preservation in expert hands will take care of itself as a matter of course.

But just now it is for an assembly like this to make the demand before we reach the dead point, instead of waiting until that comes. How can we do it? First, by working in our own States in the way that the Governors in their speeches, and the experts in their speeches, have indicated; and still more I think by putting pressure on the National Government in favor of the extension of forest reservation in every possible way. [Applause] Powerful as we are in our own States, an assembly like this, called by the President, is yet more powerful in carrying the public opinion of the country with it; and we stand here for the principle that our Government should not be a Government for the interest of individuals, not even a Government for the temporary interests of the country, but a Government for the permanent interests of the whole country. [Applause]

Second, we have it in our power also, as has been suggested, to make intelligent forestry by individuals more profitable than it is today. [Applause] Suggestions have been made regarding possible changes in tax laws. I shall not try to repeat them. But by the appointment of committees, by the exchange of expert opinions, a body like this can make a great many things that do not quite pay today, and yet are overwhelmingly for the public interest, pay five or ten years hence. The margin between business that succeeds and business that fails is a narrow one, and by just covering that margin by differences in tax laws, by differences in protective laws, by laws for the prevention of fires, we can make profitable an industry which the public needs, but which today is unprofitable.

So I believe, Gentlemen, you have it in your hands to put this great national work where twenty years hence it will take care of itself. [Applause]

The **Presiding Officer** (Governor **Johnson**): Governor Glenn is called for. [Applause]

ADDRESS BY ROBERT B. GLENN

GOVERNOR OF NORTH CAROLINA

Mr President, Governors, and Gentlemen of the Conference:

In the language of one of the greatest sages and statesmen of this Union, Grover Cleveland, [applause] today "A condition and not a theory confronts us." We have just heard from the very able paper of the vigorous and patriotic President of the United States [great applause] something as to our duty in conserving our resources; and we have also heard from the exhaustive papers of Mr Carnegie, Mr Hill, and others, that something must be done, and done at once, to preserve the natural resources of this great Nation.

Now, Mr President, what has produced this condition? If you have listened attentively to these papers, you have learned that our forests are being denuded; our land is being washed away and made worthless; our water powers are exhausted; our harbors are filling up with silt, thereby paralyzing our commerce—and something must be done to stop this waste and extravagance and to bring forward a remedy, else this great Nation can not go forward in the future as it is doing today.

What is the most serious of all these terrible conditions now confronting our People? I can answer in almost one word. It is the failure of the People throughout the States to protect the great forest industry of our country. [Applause] This is one of the chief sources if not the greatest source of all the ills of which we have just heard. Our People, regardless of the future, have been living only for the present, thinking of themselves and not of their children and their childrens' children, thinking selfishly and not as patriots should and ought to think. Lumbermen are going into these forests today and wastefully destroying them. Following fast in their wake comes another class of timber hunters, after pulp and bark for tannic acid; and behind these, as a still greater curse, comes the vandal with his torch, destroying even the shrubs and leaves that are left by those who have gone before. Taking them together—the lumberman, the pulp-man, the acid hunter, and the vandals—they constitute a great army that is fast bringing our forests to waste and destroying the industries of our country. And this vandalism must be stayed. There must be an end to this waste, or else dire distress must be the portion of our People. Unless it is stayed, there is no hope for preserving our resources or protecting our soil. Our forests denuded, our trees gone; no longer any decaying matter or leaves as sponges to take up the rains as they fall from heaven. What, Sir, is the result? The rain comes down on the rocks and barren soil, runs into the little crevices and channels until, becoming a mighty torrent, it rushes into the branches and creeks, causing them to overflow their banks; and they in turn rush on into the rivers with the same dire consequences, carrying everything before them. What then do we see? No longer water trickling through the leaves and falling gently into the creeks and rivers, but instead a roaring flood sweeping everything before it.

The Secretary of Agriculture of the United States says that in 1901 and 1902 the damage done by reason of this denudation of forests amounted in the Appalachian section to $18,000,000. This may have been an extraordinary year, but I can say today with truth that the damage to this section will average year in and year out from seven to eight million dollars. The streams, being filled by the water carrying trash and silt and gravel into them, are made level with their banks, and it takes only a little rain to overflow everything, and as it comes rushing down it meets an obstacle. What is that obstacle? It is the obstacle of a dam erected by the manufacturer, or by the man who is making electric power for the purpose of communicating this power to machinery, or for lighting cities. Those dams fill up, and what happens? The arm of industry is paralyzed. The employees for the time being are thrown out of employment, and hundreds and thousands of dollars are wasted and lost. The difference between the cost of steam and water power, at the very lowest estimate, is $10.00 per horse-power. The lowest estimate made in regard to the water power ruined in New Hampshire and the South is one million horse-power, which is equivalent to $10,000,000 per annum. The highest estimate is 3,000,000 horse-power, which means $30,000,000 per annum to the manufacturers of the White Mountain and Appalachian section.

And is this all? No, Sir! This sand, coming down and filling up the rivers, is then emptied into the harbors, and it requires millions of dollars to clean them out, else navigation is impeded and commerce is stopped, while if we would only lay our hands upon the source of all this evil—the denuding of our forests—and stop this vandalism, navigation, commerce, manufactories, and land, would all be preserved and benefited.

There must be some remedy for this, Mr President, and that remedy should come alike from the States and the Nation. The States should go hand in hand with each other, the Nation helping all. [Great applause]

Last night at a banquet given to the Governors of this Conference, Speaker Cannon said the townships should commence this work, then the counties, then the State, and as a last and final resort the Nation be called upon for help and succor. Mr President, the townships of the various States, the counties of the various States, and the States themselves have already acted. We have cleaned out our little creeks and rivers; stopped the cutting of our timber by indictment, and tried to protect our great resources as best we could. But the States by themselves are helpless. The arm of the Nation must be used to aid the People, or else we can not get relief. [Applause] A State can control intra-state commerce, but a State is powerless to control interstate commerce. So likewise a State can control intra-state destruction, but a State is powerless to control and regulate interstate destruction. [Applause]

Let me see if I can make myself clear. Look at the map of North Carolina. On the top of its mountains four great rivers have their heads. One goes into the Ohio, one into the Mississippi, one into the Gulf of Mexico, and the other into the Atlantic, running through the States of South Carolina, Georgia, Alabama, Mississippi, Tennessee and Ohio. Now North Carolina could buy this land and stop this destruction to the other States; but suppose North Carolina refused to do so? The other States would be helpless. Or suppose North Carolina was willing to do so, and the other States refused to act; what relief would come? But when the great Nation—the mother of all—takes charge of these vast forest preserves, stops the waste therein and opens up all our streams running through the different States, then will the benefit be felt by all and protection come to all.

I think, Mr President, there is relief in a bill now pending in Congress, and which if passed promises to remedy this condition; [applause] and I say to the members of the Senate and of the House of Representatives that if they will only pass that bill, every State Government from Maine to Texas and from the Atlantic to the Pacific coast will cooperate with this Government in bringing about a condition of things that would build up our Nation, and make it, as it is entitled to be, the greatest Nation on earth. [Great applause]

Since 1899 up to the present time, we have been coming before Congress asking relief. Five times, representing my State, have I been here in its name, knocking at the doors of Congress and asking help. Each time they have put us off, saying "Not now, but next session." When, Mr President, is the next session to come? [Laughter and applause] Will they wait until all our forests are cut down and denuded; until all the lands along our rivers are destroyed; until the rivers themselves are filled up with mud and gravel, our manufactories discontinued, our harbors made ineffectual, and our commerce paralyzed? If we wait until then, Mr President, we will not need help. We want it now, and must have it now. [Applause]

This Conference ought to pass a resolution, endorsed by every Governor of every State, demanding that this present Congress no longer defer this matter, but that even in the short time yet remaining of this session they pass this bill that means so much to the happiness, prosperity, wealth, and power of all our people. [Great applause]

Vox Dei is calling for the preservation of the forests for humanity's sake, for health's sake. Vox populi is calling for the prevention of this waste, for manufacturing purposes, for electrical purposes, for commercial purposes—and vox Dei and vox populi shall and must be heard, or else we give fair warning to Congress that, failing to listen to the demands of our People as year after year we come urging its members to do their duty, we will arise in our might and select men who will listen, and give us the relief demanded. [Great applause]

Governors of the great West, the members from the South have stood by you in your forest preservation, spending millions of dollars in buying 92,000,000 acres of land west of the Rockies for the benefit of your people; we have stood by you in all the acts that you have asked looking to irrigation, [applause and cries of "That's so!"] thus preserving your farming lands; and we have stood by you in every solitary thing that the great West has deemed necessary for its upbuilding and its glory. And coming today, voicing the demands of Maine, New Hampshire, Rhode Island, Connecticut, Massachusetts, New York, Pennsylvania, West Virginia, Virginia, North Carolina, South Carolina, Tennessee, Georgia, Alabama and Mississippi, I plead with you to be as generous as we have been to you, and come to our relief by joining with us in trying to save our section from this waste and devastation before we are ruined. [Great applause]

We will plant our crops, as you suggest; we will sow our grasses upon our lands; but, Sir, so long as these floods come tearing down into our rivers and into our valleys, the crops that we have planted are absolutely worthless, and our sowing and our planting are in vain. [Applause]

In conclusion I desire to answer one remark of Speaker Cannon when a committee of us went to him to ask that he let our bill be heard on the floor of the House. He said that the New England States ought to form a confederation, and the Southern States form a confederation, and not trouble the Union—that confederation, and not money from the National treasury, ought to be the means used to stop this waste and destruction. Now, Mr President, I can not answer for the New England States, but I can answer for the South. We tried Confederation once, and we found it did not pay. [Great applause] You told us then that we ought to stay in the Union, and then we could get all we wanted; and now we have come into the Union and humbly made our request, showing our needs—and we do beg that we shall not be rebuffed in this very first application that we make for relief by being told to "confederate." [Long-continued applause] I have already shown how a confederation of the States, unless all were willing, would be of no avail; but the Union being higher than all, would protect the respective rights of each in fairness and justice.

We do not come as paupers, Mr President. Last year the South added $7,300,000 per day to the wealth of this Nation. We made 12,000,000 bales of cotton and ourselves used 2,750,000 of these bales. Some 9,346,000 spindles made sweet music in our mills; 71,000,000 tons of coal were contributed to warming our country, and 60,000,000 barrels of oil added light to our Nation. Eighty percent of all the cotton raised in the world is raised in the South; 75% of all the tobacco is likewise raised there. One-third of all the standing timber comes from our section, and last but not least, we raise 99% of all the peanuts of the whole world—so essential to baseball, football and circuses. [Laughter] For five years the total output of the value of the Southern cotton crop has exceeded the total output of the gold and silver of the world, $395,000,000. We therefore come, not as supplicants, but as builders and preservers of the Nation. [Applause]

It was said yesterday by a distinguished speaker that there was no North, South, East or West. Today I say to you, standing here, the son of a Confederate soldier who died for the Lost Cause, and making no apology for my father, who did what he thought was right, and did what his son would do today under similar circumstances, that I yield to no Governor in this Conference in my love for the Union and my desire to protect and upbuild it in all of its resources; and therefore as a loyal Union citizen—just as true to its interests as any man born in the North could possibly be—speaking for my State and for the great section from which I hail, I ask that its resources be preserved and its wealth be increased, and its people made happy, by granting to us the little pittance now asked for the preservation of our forests and lands, our waterways and our harbors, as set forth in the bill pending before the present Congress. [Great and prolonged applause]

The PRESIDING OFFICER (Governor JOHNSON): Mr La Lanne is recognized.

REMARKS BY FRANK D. LA LANNE

PRESIDENT OF THE NATIONAL BOARD OF TRADE

Mr President:

I speak for the National Board of Trade, now 40 years old, and comprising about eighty of the greatest Commercial Boards of our country, including one from Hawaii and one from Porto Rico. Our constituent members represent most of the States, so we are as deeply interested in the preservation of our natural resources as such great interests which we represent would naturally be. Ever since our organization we have worked with earnestness before Congressional Committees for River and Harbor improvements; we have voiced our approval, Mr President, of your wise and patriotic appointment of the Inland Waterways Commission, whose makeup of men of great experience, ability and telling work the whole country fully values; and we have urgently asked our Congressmen to make an adequate appropriation for its continuance, for we believe in our hearts that such a commission is the best instrument for a fair distribution of its fullest share of appropriations to every deserving project. A commission of this kind and quality we believe should always be in existence to hear the demands of the country and decide fairly upon their merits. Our organization has for years been outspoken before committees of Congress and at our own Conventions for forest preservation; and particularly have we desired action taken immediately for the forest reserves in the White Mountains and the Appalachians. As an earnest of our influential work we have met with Mr Pinchot before the last Congressional committees to give his splendid work all the help in our power.

Our most willing help was given to the Lakes-to-Gulf Deep Waterways Conventions, and to the Atlantic Deeper Waterways Association. We also sent our President to represent us at the National Drainage Association Congress in Washington, D. C., May 12 of this year.

The Committee on Forestry and Irrigation of the National Board, being headed by a man who has for many years made a serious study of this most important subject, and who is present and can give a better idea of what we have done, I ask the Chair for the pleasure of presenting Colonel William S. Harvey, Chairman of the Forestry and Irrigation Committee of the National Board of Trade.

The PRESIDING OFFICER: We will recognize him later on. Governor Davidson of Wisconsin now has the floor.

ADDRESS BY JAMES O. DAVIDSON

GOVERNOR OF WISCONSIN

Mr President, Governors, and Gentlemen of the Conference:

One of the greatest problems with which the people of this country are confronted today is the preservation from destruction of our natural resources. Few countries possess natural wealth of so varied a nature and of such immense value, yet nowhere has the use of this wealth been marked with less foresight and more indifference on the part of the public. For years scientists and students of our natural resources have sought to call attention to the early exhaustion of our forests, coal and mineral beds, and oil wells, to the great permanent injury of the People. But they, busily engaged in the pursuit of their various occupations, and, inspired by optimism, feeling that somehow matters would be corrected, have postponed their consideration to the time when the evil should have taken a more concrete and urgent form.

To no State in the Union is this question of more vital importance than to the State of Wisconsin. But a few decades ago, its northern and eastern parts represented a broad forest, broken only by occasional sections of prairie. Pine, hemlock, oak and maple grew in such abundance, it was the proud boast that Wisconsin alone could supply the entire country with timber for a century. Amid these great forests were large swamps and hundreds of small lakes from which deep, swift streams rushed to form rivers which gave their volume to the Mississippi. With its great forest wealth and its immense water power, Wisconsin, like its sister States, lived only in the immediate present.

Great lumber companies, inspired only by enthusiasm and too often greed which knew no bounds, attacked these forests, each in a mad race to strip its territory and market its timber first; then to move forward and continue the destruction. No tree was regarded too small to escape cutting. Trunks six inches in diameter were cut for market purposes. Millions of young trees and saplings which were too small for commercial value were crushed by falling timber, or were cut to make room for logging roads. What escaped the hand of the logging crew fell victim to forest fires, which counted their destruction by millions of dollars, in further evidence of the carelessness with which our forest tracts were guarded.

Today we are beginning to pay the penalty for this indifference. Our proud position as the greatest timber State of the Union has passed to others. Thousands of acres of land of no value for agriculture have been rendered bare and practically without a market; our swamps are becoming dry, and many of our streams are shrinking to but a small proportion of their former size. The destruction of our forests has taken from us that great regulator of the streams, for with no forest to protect the headwaters of rivers and to detain the water in the soil, we frequently have freshets and floods and are confronted with the problem of dealing with rapidly rising and falling stream-volume. Wisconsin has, however, now awakened to its duty to the public. Through liberal and wise policies of its Legislature it has dealt with this problem in a scientific and comprehensive manner. It created the first State Forest Commission ever appointed by any of the States, which has already developed into a Board whose labor is characterized by a continuous, constant, and progressive policy of forestry administration. Adequate powers have been given by statute to this body, and ample appropriation has been made to insure their successful exercise.

Under these laws much progress in forestry work has been made. The damage which was ruthlessly committed will require more than a generation to mend, but it is believed that a thoughtful public interest has been aroused, and that the strong work of restoration will be generously aided. Vast tracts of public lands have been made forest reserves. Agriculturally profitable land has been sold, and the proceeds used to extend the reserves in less fertile soil. The United States Government has added a large tract, aimed to protect the headwaters of our large rivers; while lumber companies, recognizing the wise policy of the State, have dedicated to the forest reserve several thousand acres. Appropriations have been made to enable the State to preserve certain tax-title lands to add to these reserves, while the tax laws have been so altered as to relieve the burden of tax upon lands planted with trees; and it is hoped that laws will be passed encouraging owners to cut timber conservatively under forestry regulation, rather than oblige them to cut quickly as possible to escape the injustice of taxation.

Under these laws Wisconsin has acquired over 300,000 acres, which is constantly being extended. It has been the policy to concentrate these holdings in those counties having the greatest number of lakes feeding into large streams, and in some counties the State now so holds 10% of the entire land area. These large reserves are maintaining a timber supply, will provide great parks for pleasure seekers, and most important of all, will protect the many water powers, and with them the greatest manufacturing interests of the State.

For the further protection of its water powers the legislature has authorized corporations to erect a series of storage reservoirs on certain streams, thus producing a uniform flow of water through the season. The State Board of Forestry determines where dams shall be built, their height, the amount of land which shall be overflowed, and the time and manner in which the water shall be drawn from the reservoirs. Upon certain storage capacity being realized, the holders are permitted to charge reasonable tolls for the water used, which tolls shall not exceed a net annual return of 6% on the cash capital paid in. The capital of these companies and the rates charged are under the strict regulation of the State Railroad Commission. In all these provisions the rights of the public are strongly safeguarded, and in addition there has been reserved to the State the right to take over all such reservoir property at a fair valuation. No other State has such a comprehensive code of laws for the regulation of private corporations owning reservoirs and water powers, and therefore this point is especially called to the attention of this Conference.

Forestry is a new science in America. No country has greater need for the adoption of its teachings. Nowhere are the conditions for a broad forestry policy more favorable. The National and State governments still possess millions of acres of rich forests, a part of which should be preserved for the benefit of future generations. When it is once thoroughly understood that scientific forestry does not mean the withholding of valuable agricultural soil, but only the retention for timber of such lands as are less profitable for other purposes, it is difficult to conceive of any sound arguments against it. The public forests are public reserves, and should be protected for the benefit of the public and enlarged as conditions permit. When timber shall have ceased to be available for fuel purposes, when coal beds shall have approached exhaustion, it is in the great forest tracts that we will find the conservators of the substitute for fuel—water power; and in addition, this will rank as a prolific source of public revenue.

Governor **Folk**: Mr President, I move that the Conference do now adjourn.

The motion was seconded by several voices.

The **Presiding Officer** (Governor **Johnson**): Before taking action on that motion: the Committee on Resolutions requests that all resolutions to be presented be handed to the Committee this morning, in order that a proper report may be made.

Acting Secretary **Newell**: I have been requested to ask all speakers whose names appear on the program, whether they have already spoken or not, to present themselves in front of the White House immediately on adjournment, for the purpose of having their photographs taken; and in addition to what the Presiding Officer announced this morning with regard to Mr Pinchot's reception, I wish to say that Mr Pinchot authorizes me to say that the reception is open to the Conferees in general, and whether or not he has an invitation any member of the Conference will be welcome.

Thereupon, at 1:10 oclock p. m., the Conference took a recess until 2:30 oclock p. m.

FOURTH SESSION

The Fourth Session of the Conference was called to order at 2:45 p. m., May 14, 1908, in the East Room of the White House by the President of the United States.

The **PRESIDENT**: This afternoon, when I leave, Governor Deneen of Illinois will take the chair.

We will listen first to ex-Governor Pardee of California.

Governor **FORT**: Mr President, before we start the regular exercises, may I make a motion? I am compelled to leave, and would like the privilege of having put in the Proceedings the short address I have prepared on the waterway question touching my own State, and which is now in the hands of the stenographers.

The **PRESIDENT**: Governor Fort is obliged to leave this afternoon, and asks that the address which he has prepared upon the waterways of New Jersey shall be put in the Proceedings. I assume that there will be no objection. Is there objection? [After a pause] There being no objection, it will be so put.

[The address appears in the Proceedings of the Third Session]

Mr **BRYAN**: Is it not probable that a number of these gentlemen may have addresses that can not be delivered in full, and would it not be wise to extend that privilege?

Governor **FORT**: I should like to have that done.

Mr **BRYAN**: The same privilege should be extended to all who have addresses that they do not have an opportunity of delivering. I make that motion.

The **PRESIDENT**: That is, I think, a most admirable suggestion. Mr Bryan moves that any of the gentlemen who have been invited here who, either on account of being called away or for any other reason, are not able to deliver their addresses, shall have the privilege of submitting them in writing to be included in the Proceedings. Is there any objection?

Governor **NOEL**: I move that the privilege be further extended to those who may have made addresses and have not had a chance to deliver them in full.

The **PRESIDENT**: I think that would be included in the motion. Is there any objection? [After a pause] There seems to be no objection, and it will be so ordered.

Mr **LONG**: Mr President, having had the experience I had this morning, and knowing something of the amount of time required to prepare an address on any one of these important questions, I realize that it is simply impossible to deliver it in the time required, 20 minutes, and I therefore move that the gentlemen who have set papers from now on be allowed sufficient time to complete them.

The **PRESIDENT** [After a pause]: The Chair hears no second [Applause]

Will ex-Governor Pardee take the floor?

RESOURCES RELATED TO IRRIGATION

GEORGE C. PARDEE, M. D.

RECENTLY GOVERNOR OF CALIFORNIA

Mr President and Gentlemen:

On my journey over here from the Golden Gate, I passed through twelve States. They are California, Nevada, Utah, Wyoming, Nebraska, Iowa, Illinois, Indiana, Ohio, West Virginia, Pennsylvania, and Maryland. And in every one of those States I found the same conditions existing, the same outcry from the people, the same wasting of the natural resources of the country; the rivers running unused to the ocean; the forests disappearing; the mines being exhausted; and in but very few of those States was anything being done to retain those things which are of the utmost importance not alone to those of us who are here today, but also to our children and our children's children, even unto the final generation of American citizens. I found the Sacramento and its tributaries practically unused; I found the Missouri, once the home of a busy fleet of steamboats, deserted; I found the Mississippi and its great system of affluents running uselessly to the sea. And yet within the last year or two the railroads of this country were unable to handle the business which our citizens had confided to them. [Applause] Those rivers, able to carry upon their bosoms the commerce of a Nation, are allowed to go with hardly a single wheel to disturb their surfaces.

Mr Hill has told us within the last six months that it would require five billion dollars to make the railroads of this Nation able to take care of the business which is now being offered to them; and if our country increases in population and wealth, it will of course require several billions of dollars more than the five impossible billions which we are now asked to give for the increase of our railroad facilities.

And yet the experts tell us that the expenditure of one-half a billion dollars—$500,000,000—will enable our waterways and harbors to take care of that part of the commerce of the country which the railroads can not handle. Here before me I see the Governors of almost all of the States of this Union, and here in the Capital of the Nation sits the Congress of the United States within reach of your voices, so that you can go and tell those Legislators of the country what we ought to have. [Applause]

I notice the instantaneous applause which has greeted every reference to the inland waterways of the country, and I take it that you will agree with me that first of all the waterways should be preserved. And in order to do that, the forests must be taken care of, and upon the taking care of the forests, as you have so many times been told here today and yesterday, and will be told again today and tomorrow, is the means on which nearly all the things which we are here discussing absolutely depend. [Applause]

Let me interpolate here, and say that these photographs which are being shown at my left represent what the Reclamation Service has been doing in the West and Southwest. Dams are being built to store the waters of the rivers at present unused, so that they may be turned out upon those arid and semi-arid millions of acres, where, in the time to come, the great civilization of this land, and therefore of this world, will be congregated. There, on a few irrigated acres, a family of American children may be raised and given the benefit of country and urban civilization both in one.

The time of the great ranch, such as we had in California and now have in Arizona and New Mexico, has passed. The time is here when the American People, instead of requiring 160 acres of land on which to raise an American family, should be, will be, and must be content with a much smaller irrigated acreage, the proper tilling of which will occupy all their time and effort. And this kind of work is what will give the land to those American families who are now unable to find homes on our disappearing public lands. They tell me that the Reclamation Service has already opened up waterways and ditches which, if joined, end to end, would reach from San Francisco to Denver. [Applause] And yet they have made but a beginning in the work. [Applause.]

Gentlemen, the problems facing us are most important. They strike at the very root of the present and future prosperity of the country.

Is not the time for talking past? Has not the time arrived when the representatives of 80,000,000 People here assembled on the floor of this room shall show to Congress that the People of the country must have the things which we are here discussing; [applause] must have the forests preserved; must have the inland waterways deepened and made capable of carrying the growing commerce of the country; [applause] must have the arid and semi-arid West and Southwest taken care of to reserve that overflow of the agricultural population which is now heading, I am alarmed to say, too much to the cities—*must* have all these things taken care of in a wise and beneficient way under the leadership of him who sits upon my right and whom we are here today to honor? [Loud applause and prolonged cheers]

Gentlemen, perhaps it would be revolutionary; but if I were at present a Governor instead of an ex-Governor, I would suggest that my colleagues from the various States meet, for instance, with the Committee on Agriculture of the House of Representatives and show the Committee by the presence of the Governors of 44 States that what this Conference talks about it means, and what it means it wants, and what it wants it ought to have. [Applause and cheers]

We have a way of doing things in California. My native city, which but two years ago was swept by the flames of a great conflagration and lay prostrate in the dust, has within those two years almost rehabilitated itself; and here are 44 Governors who can take themselves to the capitol and have Congress rehabilitate the natural resources of the country which have been so shamefully wasted. [Loud applause]

The fuller opening statement follows in the succeeding paragraphs:

All natural resources are interdependent. Ores can not successfully be mined and reduced without coal or other fuel, nor can coal be utilized fully except through the use of metals; while neither metal nor fuel can be put to the best use independently of the soil and its products. The resources of the land are especially interdependent; without rainfall there is neither soil nor produce; without soil there is no produce, however abundant the rainfall; without both soil and produce the rainfall is a scourge rather than a boon. With adequate water-supply and a fertile soil, forests and herbage or crops are produced in abundance; but without the protection afforded by the natural or artificial cover the soil is quickly eroded, the land impoverished, and the streams destroyed.

Probably nowhere in the world, certainly nowhere else in this country, is the interdependence of the resources of the land more clearly shown than in California; and here as in several other western States the natural relations between water, soil, and produce are coming under artificial control by means of reclamation through irrigation and drainage.

Southern California depends for its water-supply on ditches taking the water from the mountain streams which sink on entering the valleys, and on wells. Its forestry problem consists in the planting of new forests on its bare mountains rather than in the protection and conservation of existing forests. Its water problem, dependent on that of reforestation, consists in creating new natural forest-litter reservoirs for the retention of the melting snows and rains which now run off the bare mountains in floods to the ocean.

In northern California the stream and forest problems consist in protection, preservation, and conservation. On the solving of these problems depend the following most important matters for the future of the State:

1. Irrigation
2. Navigation
3. Electric power
4. Reclamation of swamp and overflow lands
5. Lumber and timber

IRRIGATION

The great San Joaquin and Sacramento valleys, which, in reality, are but one great valley, contain about 10,000,000 acres of level and rolling foothill land, fertile but arid and semi-arid, and on the average worth not more than $30 per acre, a total of $300,000,000. Irrigated and intensively cultivated, the 10,000,000 acres will be easily worth $150 per acre; a total value of $1,500,000,000, as against $300,000,000 at present.

Fifteen years ago, the population was no more, in cities, towns and country, than 60,000. Today, there are easily 300,000 people in the same territory. Ten acres of this irrigated land will support a family in great comfort. In fact, a man and his wife have lived in comfort for many years from the products of one such acre, a part of which is covered with buildings; and they have, besides, a constantly increasing bank account.

Through this valley from the south runs the San Joaquin river, joining the Sacramento, which runs from the north at a common mouth in the bay of San Francisco. Running into these two rivers from the eastward-lying Sierra Nevada Mountains, are many streams. In the southern part of the San Joaquin valley, the water of these streams has all been appropriated for irrigation purposes.

It is estimated that two acre-feet of water per annum are sufficient to irrigate the lands in the Sacramento and San Joaquin valleys. It is also estimated that, with all the streams utilized for that purpose and the flood waters stored in suitable reservoirs, there would be enough water available for the economical and close irrigation of nearly all of the 10,000,000 acres of these valleys. Add to this the wells which experience has shown can be used for irrigation in many parts of these valleys, and the future population, urban and agricultural, of this great stretch of country can safely be set at 10,000,000.

NATIONAL FORESTS

In order that these streams may be made to yield as great a low-water supply as possible, the President has very wisely made national forest reserves along their headwaters. These reserves, lying along the crests and higher slopes of the Sierras, cover about 15,000,000 acres, nearly one-sixth of the whole State, and guarantee the preservation of a large part of the Sierra forests. They will also go far toward conserving the waters of the mountain streams for irrigation and power purposes.

The Reclamation Service has given considerable attention to the matter of reservoirs for impounding flood-waters. One such proposed reservoir, in Pit river, will impound two seasons' floods of that stream, and will furnish irrigation-water for about 2,000,000 acres. From Clear lake, in the Coast Range, 250,000 acres of Sacramento valley land can be irrigated. Several other storage reservoir sites have been found.

NAVIGATION

In 1849, Sacramento river was freely navigable, by the small ocean-going craft of that period, up to ten or twelve feet draft, to and above Sacramento, where there was a tide of 2½ feet—more than one hundred miles, by river, from San Francisco. There being no railroads until 1868, Sacramento river floated a very numerous fleet of steamboats, some of those devoted to passenger service being 1,500 tons burden and drawing ten feet or more of water. Above Sacramento, as far as Red Bluff, another hundred miles, a numerous and busy fleet of light-draft boats plied. Such boats also turned out of the Sacramento into the Feather and from the latter into the Yuba, to land at Marysville.

The lower San Joaquin was also freely navigable for light-draft boats, a large fleet of which went to the city of Stockton. And, for one hundred miles above Stockton, the San Joaquin was navigable for barges towed by light-draft steamers.

It will thus be seen that, for twenty years after the admission of the State into the Union, the river system of Northern California was its most important, quickest and cheapest means of inland transportation.

Through the agency of the hydraulic-mining operations on the Yuba, Bear and American rivers and their tributaries, literally billions of tons of debris were washed into these rivers and completely filled their beds. Marysville, which was an important steamboat town and did not require levees, has been compelled to spend a million or more dollars to protect itself with fifteen-foot levees from floods out of the Yuba, has had to pay taxes of from 6% to 8%, has not heard a steamboat whistle for over a third of a century, and now finds the surface of the sand which fills the bed of Yuba river nearly on a level with her streets. Twenty miles above Marysville, where the river-bed is half a mile wide, it is estimated that there are 190 feet of mining debris in the Yuba, filling the channel from bank to bank. At Sacramento there is now less than six inches of tide, only one-fifth that of fifty years ago.

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The Yuba, the Bear, and the American are all fiercely torrential streams. The filling up of their beds has caused them to overflow and cover with debris many farms and orchards lying contiguous to them. Sacramento city has been compelled, like Marysville, to levee heavily to keep out the floods.

The hydraulic-mining operations have completely annihilated the navigation of the Feather and the Yuba, and that of the Sacramento has been greatly impeded. Thirty-five years ago boats drawing ten feet could readily reach Sacramento at practically all stages of the river; now boats drawing four to five feet have great difficulty in doing so. Above Sacramento, Red Bluff, formerly easily reached, is now shut out from steamboat communication, except at the highest stages of the river. Endeavoring to restrain the debris in Yuba river and keep it from going into the Feather and thence into the Sacramento, the State of California and the Federal Government have spent about a million dollars in unsuccessful attempts to maintain dams across the Yuba. Because of the shifting character of the sand on which it was necessary to build the dams, none of them has stood.

Mining operations on some of the tributaries of the San Joaquin, notably the Calaveras, caused also a similar, but less destructive, shoaling of this river in its lower reaches.

RELATION OF RAILROADS TO RIVER TRAFFIC

In 1868, the Central Pacific Railroad was completed from Sacramento, via Stockton, to San Francisco. As has been so frequently the result where a railroad parallels a navigable river, the Central Pacific soon acquired or drove out of business the boats plying on Sacramento river. The capital city, being made a division end and a shop town, quite readily acquiesced in the seizing of the river by the railroad. Stockton, however, refused to submit to railroad domination. It still retains and patronizes river boats in opposition to the railroad. In place of the large number of comfortable boats which it found on Sacramento river, the railroad now maintains a very small number of inferior boats which strive for business only to and from non-railroad points, and are so conducted as not to invite business to or from railroad points, and to prevent the appearance of competing boats.

In the early '70's the railroad was built from Sacramento to Marysville and Red Bluff. Owing to the destruction of navigation and its absolute monopoly, and judging from the freight rates on the infrequent boats to Red Bluff, it is estimated that the Southern Pacific collects freight rates on Marysville business from one and one-half to twice what they would be if the old-time navigation of the Sacramento, Feather, and Yuba were now possible.

The following will illustrate what a check on railroad-monopoly extortion even a partially navigable river may be: Along Sacramento river, above Sacramento city, lying from ten to fifteen miles from the river, is a belt of wheat land. Freight rates on the railroad tributary to this land are so high that it was formerly the custom of the farmers to haul their wheat by team to the river, store it on the river-bank, and wait several months until the river rose enough to enable a steamboat to come along and take it off. To get that grain as freight, the Southern Pacific, although forbidden by the California Constitution to do so, used to pay the warehouse men along the line of their road secret rebates on all the grain shipped from their warehouses, so that the warehouse men could, by low storage charges, induce the farmers to ship their grain over the railroad rather than wait for the coming of high water and the infrequent steamboat.

Comparing Sacramento railroad rates with those of railroad towns not on navigable water, at about the same distance from San Francisco, it is estimated that the river communication reduces Sacramento's freight rates from 25% to 50% below what they would be if the Sacramento, like the Yuba, were unnavigable.

Stockton, by encouraging and supporting navigation in opposition to the railroad, is able, it is estimated, to get freight rates from 50% to 75% lower than they would be if the San Joaquin were not navigable.

ELECTRIC POWER

The commercially important streams of California are practically confined to those which run down the western slopes of the Sierra Nevada mountains. Many of these streams fall from 4,000 to 6,000 feet in a distance of from 25 to 40 miles, thus furnishing opportunity for the development of great power. The streams which run down the western slopes of the Coast Range into the ocean are not, as a rule, available for power, the summer run-off being small; while practically no streams run down the eastern slopes of these mountains. The streams which rise on the eastern slopes of the Sierras are of little importance to California as a whole.

It has been estimated that the utilization of all the stream power, from Mt. Shasta to the Tehachapis, a distance of 600 miles, will produce 5,000,000 horsepower of electric energy, equivalent to 100,000,000 tons of coal per annum, costing at present prices over $1,000,000,000. The utilization of all this water power would therefore save $1,000,000,000 in cost of fuel, and produce $1,000,000,000 worth of new property. Already, something like 250,000 horsepower are being used in propelling street and interurban railway cars and for other power in northern California. The actual investment in such enterprises is estimated to be between $15,000,000 and $20,000,000.

The streams from which power may be obtained have been, within the last few years, filed upon in such numbers, under the lax laws of California and the United States, that the fear is expressed in many directions that the power has been already pretty well taken up. Many of these filings are for purely speculative purposes; others are for future development; but comparatively few of them are actually being used or are in process of preparation for utilization. The fear is prevalent that the acquisition of these water rights by private persons or corporations will lead to monopolies and over-capitalizations, and that these great and most important natural resources will not be at the cheap disposal of the people. In fact, already, by means of purchase, by bond and stock issues, as practised by some of the railroad and industrial corporations of the country, the electric power used in the various cities of northern California has fallen very much into the hands of one corporation, which, it is claimed, is greatly overcapitalized. The cost of electric power to the consumer is maintained at a price which makes it but little, if any, cheaper than coal, approaching in price ten dollars or even more per ton. Bearing in mind the results of railroad monopoly by means of consolidations brought about by similar means, it is not difficult to foretell the results of similar monopolization of the power of the streams of California.

The action of the United States Government, however, in regulating the use of these streams, ought to prevent an absolute and oppressive monopolization of them.

RECLAMATION OF SWAMP AND OVERFLOW LANDS

Both above and below Sacramento city and on the San Joaquin at and above its mouth, there is a stretch of very fertile land, about 1,500,000 acres in extent, about one-fourth of which has been reclaimed. Owing, however, to the partial choking of the bed of Sacramento river, these reclaimed lands are in annual danger of flooding. A levee-break four years ago caused damage to the extent of over $1,000,000. Plans are being considered for the combined action of the United States, the State and the land owners to avert this annual flood-danger. The cost of the work is estimated at $24,000,000. The argument in favor of the Government aiding in this work is that the United States permitted navigable rivers, which, because they were navigable, were the especial charges of the Federal Government, to become clogged with mining debris. The United States has acknowledged its responsibility by appropriating $400,000 for the purpose of aiding the State in attempting to restrain the further slipping of debris into the Feather and thence into the Sacramento.

The reclaiming of the 1,000,000 acres of unreclaimed swamp and overflow lands will enhance them in value from the $10 per acre they are now worth to at least $150 per acre, and will also increase the value of the lands which are already reclaimed. The argument is that, because the United States and the State of California permitted the navigable rivers to be filled with debris, the cost of reclamation will be three times what it would have been if these rivers had not been so choked. Therefore, it is argued, the State and the United States should each bear one-third of the cost of restoring the Sacramento to the condition which will reduce its flood-dangers to what they were before it became obstructed.

The expenditure of $24,000,000 for this purpose will add $150,000,000 of value to the land of the Sacramento and San Joaquin valleys.

TIMBER AND LUMBER

The mountains of northern California are densely forested. The western slopes of the Coast Range, from the Oregon line to San Francisco bay, are densely covered with forests of immense redwoods. There are in this stretch—probably the most densely forested in the world, measured by the amount of timber to the acre—2,000 square miles, over 1,280,000 acres. Estimating that there are, on the average, 58,000 feet of timber per acre, there was, originally, in the California redwood forests something like 75,000,000,000 feet of timber. State Forester Lull, of California, estimates that about 20%, or 15,000,000,000 feet of redwood, have already been cut.

The Sierra Nevada Mountains are forested from Mt. Shasta to the Tehachapis, a distance of six hundred miles, with a breadth of sixty-five miles. Assuming that each of the 25,000,000 acres of Sierra forests contains 5,000 feet of timber, the whole area originally contained 125,000,000,000 feet.

Redwood trees rapidly reproduce, from about the stump, a second growth. Protected from fire and properly thinned out, this second growth will, in from sixty to seventy-five years, produce merchantable trees. If properly and scientifically lumbered, the redwood forests will, therefore, be preserved and conserved for all time. It is only within the last few years, however, that the redwood lumbermen have shown any disposition to lumber their lands scientifically. In fact, it seemed to be their desire to exterminate, with axe and fire, the trees from their lands. And, doing this, it was their custom to cut only the best trees, taking from them only the best cuts, and leaving all other standing and felled timber to the mercies of the firebrand.

Within the last few years, however, in spite of the shortsighted opposition of those officials and private persons who ought to have known better, California has made a start toward an efficient forest service.

It is not yet what it should be; but a beginning has been made, and quite a number of those who wastefully lumbered their land and left it bare and fire-baked are, under the direction of the State Forester, beginning to appreciate the necessity and economy of scientific lumbering and forest-protection. The Southern Pacific, with its millions of acres of land-grant pine lands, was very much opposed to the inauguration of a State forestry policy, preferring to see thousands of acres of its timber lands annually fire-ravaged, rather than submit to supervision and regulation of its property by the State.

Of California's 100,000,000 acres of territory, nearly one-fourth is forest land lying in the two-thirds of the State comprised in northern California. It thus appears that nearly one-third of northern California is forested. On the preservation of these forests depends the future of northern California; for on them depends the preservation of the streams, and on these depend the development of electric power, the irrigation of the great interior valley, the navigation of the rivers, the reclamation of the million acres of swamp and overflow lands, and, of course, all the interests which depend directly on the preservation of the forests for the materials which they furnish to the arts and trade.

Looking toward the preservation of these forests, the President has very wisely set apart in northern California about 15,000,000 acres in national forests and national parks. This amounts to nearly three-fifths of the forest lands of northern California; so, as nearly all these reserves are in the pine-bearing lands in which head the principal industrially important streams, fully three-fifths of the acreage of the headwaters of these streams have been thus protected.

It is to be regretted that more of California's forests have not been set apart in forest reserves. What has been done in that direction is of the utmost importance for the future of California. It will be noticed, however, that, with the exception of the Monterey Forest and, possibly, the western fringe of the Klamath Forest, the magnificent redwood area has been left unprotected. Of these forests, only about 20,000,000,000 standing feet of the whole 75,000,000,000 feet seem to be in private ownership, so that there is still opportunity for the Government to exercise its benevolent care over a large portion of them. The outlook in this country for a future supply of timber is too dark to have such magnificent forests as the California redwoods overlooked and left to certain, quick and absolute destruction.

The pine lands of California, especially those of the northern part, suffered greatly, before the establishment of the forest reserve policy, from the depredations of sheep and cattle. It is the custom of the shepherds to drive their flocks into the mountains every spring. The pasturage being free and unrestricted, the sheep were driven in in such numbers that they cropped the grasses to their very roots long before they went to seed. They also browsed upon and destroyed the seedling trees, so that a country over which these four-footed immigrants had run was left bare of low-lying cover. It was also the custom of the shepherds to fire whatever dry herbage their flocks had left undestroyed, thinking thereby to make better pasturage the next season. These fires, getting into the brush and attacking the inflammable timber, annually destroyed thousands of acres of fine trees and left the ground not only entirely bare, but also fire-baked and unable to re-seed and recover itself. Between the sharp teeth and sharper hoofs of the sheep and the fires set by their shepherds, the Sierra forests of northern California were in a fair way of being quickly exterminated. The national forests have stopped most of this. Already these forests are able to feed more cattle and sheep than they previously did, while the spring growth of grasses and seedling-trees is again approaching the luxuriance which characterized it before the cattle and sheep and shepherds combined to exterminate them.

LUMBERING

California lumber, both redwood and pine, is shipped to many parts of the world. It goes east to Missouri River and beyond. It goes to South America, to Australia, to South Africa, to Japan. The result is that lumbering operations are being pushed. Of the 200,000,000,000 feet of standing timber in the State, about 36,000,000,000 feet are in private ownership. Of this, it is estimated that about 1,000,000,000 feet are being cut annually.

Making no allowances for increase of cut, destruction by fire, or saving because of better and more economical methods, at the present rate of cut the privately-owned forests of California will be practically exhausted in about thirty-five years.

Of the 75,000,000,000 feet of standing redwood, it is estimated that 20,000,000,000 feet are in private ownership, and that about 600,000,000 feet are now being cut annually. At this rate, the privately-owned redwoods will last less than thirty-five years, and all the redwoods in existence will have disappeared long before the end of this century.

Of the estimated 125,000,000,000 feet of standing Sierra timber, about 16,000,000,000 feet are in private ownership, of which something like 400,000,000 feet are being cut annually; and State Forester Lull estimates that 1,000,000 acres have been cut and another 1,000,000 acres culled. At this rate, the privately-owned Sierra timber will last only forty years.

Something like $35,000,000 are invested in the production of California lumber. The total cut of California timber is, as above stated, estimated at about 1,000,000,000 feet per annum, valued, to the consumer, at about $15,000,000. Redwood furnishes the largest cut, something like 600,000,000 feet. Next come yellow pine, with a cut approximating 250,000,000 feet; sugar pine, 85,000,000 feet; red fir, 25,000,000 feet; spruce, 25,000,000 feet; cedar, 2,000,000 feet; other conifera, 2,000,000 feet.

CONCLUSIONS

Because the State is new and but thinly populated—having only 2,000,000 people on 100,000,000 acres of territory—California's natural resources have not been, as in some of the other States, nearly or quite annihilated. Nevertheless her people have made quite extensive inroads into her forests. Because of the fact that her unforested lands have been more than sufficient for the support of her population, California has not been compelled, as other States have been, to sacrifice woodlands in order to gain land for farming purposes. The destruction of her forests has resulted only from careless and prodigal commercial operations upon them, together with fires resulting from those operations or carelessly set for other purposes. A glance at the forest maps will also show that in Oregon and Washington, with California, the nation's future store of timber is situated. Both in quantity and quality, the Pacific Coast States are now possessed of the most valuable arboreal asset of the United States. Here, then, is offered the best field for the interposition, between extermination and preservation, of the benevolence of the Federal Government for the future—the immediate future—benefit of the people of the whole United States. Here, also, is that Government's best opportunity to set itself between the rapacity of private monopoly in these natural resources and the People. If, as has been done in other States, these Californian wealths of forest and stream be allowed to fall into the merciless hands of private monopoly, rapid exhaustion of them all will soon follow, as it has in other States. Being the property of the People, they should be so administered that they will best serve the People, not only in the present, but for all time to come. They are the People's capital, which should not be impaired, only the income being used for the People's benefit. As the President so well said in his Rainy River Veto Message to Congress: "We are now at the beginning of a great development in water power. Its use through electrical transmission is entering more and more largely into every element of daily life of the People; already the evils of monopoly are becoming manifest; already the experience of the past shows the necessity of caution in making unrestricted grants of this great power." As the coal and petroleum production both decrease, the absolute need of the preservation, conservation, and protection from monopoly of the water power of the country will become more and more apparent.

The **President**: I will introduce Governor Deneen of Illinois. Governor Deneen will take the chair.

[Governor Deneen took the chair]

The **Presiding Officer**: Mr Will C. Barnes will read a statement prepared by H. A. Jastro, of California. [Applause]

Mr **Will C. Barnes**: Mr President, I regret to say on behalf of Mr Jastro that he was taken sick this morning, very suddenly, and at the last minute he asked me to attend and read his statement for him, which I shall do to the best of my ability.

In starting out, Gentlemen, I should like to say that I believe Mr Jastro is well known to all of you as President of the American National Live Stock Association, which comprises probably 90% of the live-stock growers west of the Mississippi, 80% of them being what are known as "the little fellows" in the West. Mr Jastro has been invited to attend this meeting on behalf of that association. What he says comes from a western man thoroughly conversant with every part of the live-stock industry and other matters pertaining to it, especially this matter of the wearing out of the western ranges.

GRAZING ON THE PUBLIC LANDS

H. A. Jastro

Mr President, Governors, and Gentlemen of the Conference:

While I shall discuss the general grazing problems of the West, I confine myself particularly to grazing and stock-raising in New Mexico, Arizona, and California, where the necessity for conserving the waters for utilization on the arid lands goes hand in hand with the equally important one of preserving what is left of the once-splendid grazing lands which the careless prodigality of the early settlers and occupants has almost ruined.

The lands in this region are typical of the 400,000,000 acres of arid and semi-arid country west of the Mississippi, and is the part of the United States in which I have spent the greater part of my life, and where I am most familiar with the conditions and interests connected with my subject.

The development of the stock-raising industry of the West is a matter of history. Under the Spanish rule it was an important, if not the most important, industry in that great region which lies along the Pacific coast between San Diego and Cape Mendocino.

As early as 1800 great herds of cattle and horses roamed over the plains and mountains of that section; if we may judge from the exports of hides, for which they were almost entirely raised, they numbered possibly as many head as we have in the same area today.

When in 1848 the country passed from the dominion of Mexico to the United States, a new era set in; and the discovery of gold forced the primitive Spanish ranchero, together with the Indian, into the background, so that the conditions of stock-raising gradually changed, and while the great herds disappeared their places were taken by stock of better breed and more value.

From California the stockmen seeking new lands and fresher feed pushed out eastward across deserts and mountains into the mountains of northern Arizona, where they established themselves and again dispossessed the Mexicans and Indians, who were there in small numbers, just as they had in California.

The tide of immigration flowing westward across the plains in the search for gold dropped many stragglers along the way in both New Mexico and Arizona, and finding it a country of splendid possibilities in the stock-raising line, they forsook the westward trail and became stockmen. From these beginnings the business has grown until today in California, Arizona, and New Mexico we have in round numbers over 8,000,000 sheep, nearly 3,000,000 cattle and 700,000 horses and mules, the gross estimated value of which is over $100,000,000. A large portion of this stock is supported almost wholly upon the open grazing lands of the arid and semi-arid regions of the territory mentioned. Within this area there are about 135,000,000 acres of public lands, on the proper use and development of which depends much of the future prosperity and growth of the Southwest. This vast range, with one exception, is fast being destroyed by unwise and indiscriminate use and abuse. The one exception is the lands which have been withdrawn for purposes of forest protection, and which, under a wise and efficient system of management, and especially as to its use by stockmen, is rapidly—almost miraculously in many instances—recovering its former splendid condition.

The manner in which these forest lands have been handled; the methods by which, while still furnishing almost their full amount of grazing, they have been re-seeded and are again assuming their old-time conditions—point in a most convincing and unanswerable way the course on which to proceed if the balance of these lands are to be saved and made a source of value to the People and the country in general.

Under some plan of Government control these lands can be so managed as to secure to the users—stockmen and settlers—a permanency in their business which they do not now, and never can, enjoy under our present land laws. The range wars that have been so bitter, that have cost the lives of so many men and so many thousands of stock, that have in many instances seriously retarded the development of certain sections, will cease as they have within the national forests. These lands should be segregated, and the different areas devoted to the kinds of stock for which they are best adapted according to the feed produced and the local conditions.

It is but natural that there may be many objections raised against such a plan. It contemplates a complete change in the policy and principles under which our open grazing lands have been used since the very beginning of the western tide of emigration.

That the conditions now obtaining on the public grazing lands are serious and demand some sort of remedial action, no fair-minded stockman can or does deny. It is not the remedy that is so much objected to, but rather the difficulty of devising fair means of carrying out that remedy. The stockman realizes that a remedy is badly needed, but is unable to satisfy himself just which doctor he should call. They are all anxious to be cured, but fear the means to be taken to effect the cure might seriously interfere with their personal interests. In such an emergency some controlling agency should and must step in and make the decision which the stockmen seem unable to make for themselves with any degree of unanimity.

It is hard to understand how the fear as to the manner of managing the grazing lands can be accepted as a basis for opposition to any plan of Government control when we have in the national forests, in that portion of the West with which I am thoroughly acquainted, such a splendid example of successful and practical management of similar areas, and under many more complications and vexatious problems of water-supply, forest protection, and other vital matters connected with the forests that we would not have on open grazing lands where the forests are not involved at all.

In every western State where the stockman has gone we have seen range wars and feuds between the cattlemen and sheepmen in their struggles to retain possession of certain areas or ranges that have been almost blighting in their effects on the region in which they occurred, all of which is to be attributed to absence of regulation. But within the national forests, with their forces of rangers to see that each one keeps to his own range; that no one man, no matter how great or rich or influential, trespasses on his neighbor, be he ever so small; and thus insuring to each a portion of the range upon which he is quite as secure in his tenancy as if he owned it in fee simple—these troublous times have passed away. Peace reigns now where not many years ago sheep camps were almost nightly shot up and stock of all kinds killed in wanton and criminal disregard of law and decency.

I think it is safe to say that in the past five years there has not been a single hostile shot fired on all the national forests in the United States over range rights or kindred troubles. On the other hand, but a few months ago, in one of the western States, when the sheepmen in a certain portion of the State desired to move their herds from the summer to the winter ranges, and in doing so were compelled to pass across a district around which certain stock interests and settlers had drawn a dead-line, we had the spectacle of some seventy-five or a hundred armed men, hired for the purpose by the owners, guarding their movements day and night, as if it were an army moving through an enemy's country. And this on the open ranges, the free public lands of the United States! Could any system of Government control and supervision be more objectionable than the taking of such means as this to obtain the use of the so-called free and open ranges?

No one question is more closely connected with the future prosperity of the West than is this one of the proper conservation of the water and the grass and forage of the plains and mountains. The subject in all its bearings has been thoroughly discussed by very able men, whose experience and personal observation enable them to have positive convictions—men directly interested in the utilization of the resources of this region, and who have made a study of the subject and summarized the results of the experiences of others in this direction. The American National Live Stock Association, whose yearly meetings bring together thinking men of ability, has given this subject a prominent place among the matters discussed. I can only emphasize and give my personal experience and observation in confirmation of the views so ably set forth in the discussions of the subject by the members of the Association, and by others who have made a study of and familiarized themselves with it.

Residing in Kern county, in the State of California, where the entire flowage of Kern river is applied to agricultural lands on what is known as the Kern River delta, to a large extent under my personal supervision, I can state as a fact that a very perceptible effect is observed upon the low-water flow of the river since the exclusion of sheep from the forest reserves covering the river's watershed. I need not go into a process of reasoning to account for a fact that is so obvious and so well-known. It is not claimed that the aggregate discharge of a river is increased by the growth of timber or vegetation, but it is demonstrated that the run-off is more gradual and is prolonged through a greater length of time. That is to say, the forests and vegetation serve the same purpose as artificial reservoirs, made by dams or otherwise. Also it is evident that if the ground surface is protected by timber or vegetation from erosion, artificial reservoirs are protected from being quickly filled up by silt from the mountain slopes, and disastrous torrents are prevented.

According to daily measurements of Kern river, during the period of seven years from 1899 to 1906, after the establishment of the national forests, we find an increase of minimum flow from 86.22 feet to 222.06 feet—an increase of over 50% taking place in the seventh year. Through this steady and gradual increase, the area of lands put under irrigation was increased from 130,000 acres in 1899 to over 180,000 acres in 1906.

Also, according to the statement of Elwood Mead, in his report of irrigation investigations in Califorina in 1901, there seems to be a conclusive demonstration of the favorable effect of forests on the watershed of a river on the low-water run-off. A case in point is the difference between the run-off of the two branches of Yuba river. The North Fork, being heavily timbered, furnishes 75% of the low-water flow, which is supplied from only one-tenth of the total drainage area—the watershed of the South Fork being comparatively bare of timber. Mr Mead summarizes his conclusions on this subject in the following language:

> It appears that the solution of the problem of a storage of flood waters is not in the retention of a small percentage of the storm waters behind dams, but in applying storage over the entire watershed by the systematic extension of forest and brush-covered areas.

Aside from the mineral deposits in the arid and semi-arid regions, there are but two resources to be considered—the small areas of land that may be rendered productive by the application of water for irrigation, and the vast areas of land that can never be of any value except for grazing purposes.

The solution of the problem of developing these two resources is now attracting the attention of men of ability and experience, whose many years of residence in the arid regions enables them to comprehend in all details this entire subject; but much remains that will only be solved by experience and the logic of events. For this reason it is very important that, while the subject is new, the best possible abilities and the greatest perseverance be brought to bear in devising a system of making the most profitable use of the available water supply, properly protecting the forests on which the water supply depends, and formulating regulations by which the most desirable results may be obtained from the vast areas of the arid region that can never be utilized except for grazing purposes.

It is very evident that a policy or rules for range control that would apply to an area in Arizona with possibly ten inches of rainfall per year could not be applied to an area in Oregon or Washington, where the annual rainfall is often as high as sixty inches per year; or that regulations for grazing on a section of desert region in southern Arizona which would be sufficient to fully meet all requirements could be used to any advantage on the great grassy ranges of Montana, the Dakotas, or the Northwest generally. Each section must be governed and handled in accordance with its necessities and local conditions.

Except in so far as they may relate to the lands that may be supplied with water for irrigation, the attractive generalities so much played upon by those opposing range control on the subject of home building do not apply in the "Land of Little Rain." Whatever may be the ulitimate results obtained, the situation at present can best be dealt with by the general Government.

In conclusion, I have but to add that unless a just and equitable law is promptly passed authorizing Federal protection and control of the public grazing lands, the native grasses will soon be trampled out through over-stocking; and hence the beneficial uses of these lands to the stockmen for grazing purposes will be very materially lessened. [Applause]

The PRESIDING OFFICER (Governor DENEEN): The discussion of the two statements by ex-Governor Pardee and Mr Jastro will be opened by Judge Carey, formerly United States Senator from the State of Wyoming, well known to many of you as the author of the "Carey Act."

ADDRESS BY JOSEPH M. CAREY

RECENTLY SENATOR FROM WYOMING

Mr President, Governors and Gentlemen:

I do not think it at all necessary to open a discussion on the two interesting papers just read. The field of discussion has been opened ably and widely by those who have preceded me. The people of the country will be astonished by the facts which have been disclosed by those participating in this Conference concerning the great natural resources, and the public sentiment which will be created must bring good results.

Each generation should be willing to leave after it more than it finds at its beginning. There would be little left in the world for us today if the policy had been for one age to exhaust and destroy and leave but little to the succeeding one.

Our ambition during our short stay in the world should be to accomplish much and to husband our own resources and the resources of our country. We should help ourselves, those dear to us and our neighbors, and leave behind us for the generations that shall succeed us a valuable heritage. It is true as often quoted, "We brought nothing into the world, and we can take nothing out of it;" but it is our privilege and it is in our power to make the world better and richer by our having lived in it, and make it easier for those who shall follow us. To illustrate this point, I will tell of an incident coming to my knowledge some years ago, which I used on another occasion. A man well advanced in years, but who had not lost his love for his kind, was planting apple trees on an inclement spring day. His wife called to him, "Come into the house John, it is too cold for you to be out. It is useless for you to plant more apple trees. They will not produce fruit during your life-time." His reply was, "Mary, I am willing to plant trees though they do not come into bearing during my life. I have planted many apple trees and they have borne much fruit. When I came into the world I found apples and when I go out of the world I want to leave apples for those who follow me." [Applause] That right-spirited man did live to see the trees in bearing, and his good wife lived also to partake of the fruit thereof. [Applause]

Then the question is, What can we do not only to serve ourselves but to benefit those who come after us? It is the duty of all who have a thought for our country, in our looking out for the present to keep in view the centuries which we know are to come, and which we believe will be in the life of our Government—yet to be, we hope, a greatly improved republic.

Since the country has begun to take an account of stock of its natural resources, it is not uncommon to read in the local newspapers and to hear men, broadminded as to most matters, ask the question, "What is the use of considering such questions beyond the time of our own lives and generation;" insisting that some way, not defined, will be found to make good the exhausted mine, to restore the fertility of the washed-out and overtilled fields, and to reforest the denuded mountain-sides and waste places of the continent, if such unfortunate conditions should ever come. This press and these individuals are careful to disclaim, however, that such conditions can ever arise in the United States.

Today it is possible, in a measure, to estimate some of the great known resources that are rapidly being depleted. He who ponders over such inventory, while he may feel that the exhaustion going on will not seriously affect himself or be grave during his own life, if concerned about his kind and country must be profoundly impressed, and must be moved to lend his influence and assistance to such courses of action and policies as will conserve the remaining natural resources to the extreme limit.

The best excuse that can be offered for the devastation that has taken place, notably in the exhaustion of the soil, in the cutting of the forests, in the mining of minerals, is that which we have to show in the way of development in and the growth of the country.

In the first settlements along the Atlantic coast, and the extension of these settlements further inland toward the Mississippi valley, the destruction of the forests was not wholly wanton. They were felled to make room for the husbandman and the outlining of farms which became the foundation of a well developed agriculture.

Carlessness, ignorance and indifference with reference to the cultivation of crops soon caused a great loss in the fertility of the lands. Immigration pushed forward to the prairie States, and with the advent of railroads some of the greatest lumber fields of the continent were reached and the best quality of lumber became accessible. Much of this went into the cabin, cottage, or substantial homes and buildings. With this expansion came the founding of towns and cities, which have grown to enormous proportions, until now from ocean to ocean one is scarcely out of sight of the farmhouse, village, town or city. To transform the country and to build the city caused a great drain upon the natural resources found in the beginning in the country.

The construction of the 308,000 miles of railroads that criss-cross the continent made great demands upon the iron, coal and lumber fields. To maintain and keep these arteries of traffic open will be quite as exhausting to the resources of the country as was their construction. Thousands of miles of new roads will be required each year for many years to come, which will make still greater demands on the forest and mine.

In the start the mines of coal and iron were too plentiful in North America, the fertile lands were too nearly boundless, and the forests were too numerous to create the right spirit in inaugurating such policies as would reduce the waste and consumption to the minimum. It was not believed that the natural resources of this country, so great, so rich and widespread, could be materially affected, much less exhausted.

From the statements made yesterday and today in this Conference, one must conclude that notwithstanding all that has been done in the way of development in the United States, the depletion of the great natural resources need not have been half so great as the stubborn facts today show. We can not undo the past, but we may now learn, and before it is too late, how to conserve, how to use and not waste nature's wealth, which was the foundation of the growth and advancement and which has so mightily blessed the land, and so to use and care hereafter for these resources that they shall be sufficient to meet all demands in the future. We may use but not abuse. We may exhaust but not waste. We should consume of these resources only sufficient to meet the needs of the business and commerce of the country. Beyond this is scarcely less than criminal.

Perhaps for one who lives in a great American State like Wyoming, with a small population, with so many natural resources scarcely touched, it is not wise to digress and to stray too far away from home, even in the discussion of such important problems as those being here considered.

The country included in the arid States and Territories in a certain sense stands in a reverse position from those States where the rains of the heavens are abundant and failures of crops from drouths are the exception. He who makes the deserts of the Rocky Mountains blossom exhausts not their fertility, but adds to it.

But before discussing this branch of the subject, I will direct your attention to the map on the wall to your left. About 230 miles east of the western boundary line of Nebraska, the 100th Meridian will be found. This line approximately divides the humid and semi-humid districts of the United States. On examination you will find that the area west of that line, semi-humid and desert, exceeds the area east of it, and that its drainage originates for the most part in the Rocky Mountains.

Within a radius of less than ten miles in the State of Wyoming, three of the great rivers of the continent have their origin. The Father of Waters there finds a beginning, and flows through many of the great States of the Union, giving life and wealth to millions of people, before emptying into the Gulf of Mexico. The Columbia there finds its source, then winds through the lofty and majestic mountains of the new Northwest until it reaches the sea and pours into it all the gathered waters from the mountains to the Pacific. Green River, the principal tributary of the Colorado, also takes its rise in the Yellowstone Park, and after passing through many a wild defile and deep canyon finds its way into the Gulf of California and thence into the ocean. The time will soon come when, by the construction of gigantic systems of irrigation, the waters of these great rivers will be fully utilized for the benefit of mankind, reclaiming the lands which they now drain and bringing great plains now barren into bearing.

Water is power. Water is strength. Water is health. In the Rocky Mountain States it is the most valuable of all assets. Nothing else compares with it, nothing else can compare with it. With it we can produce trees and forests. With it we can make fertile fields on the desert plains, and make the unsightly and uninviting plateau attractive for agriculture and home-building. [Applause]

What can be done by impounding, conserving, and properly using water can not be better illustrated than by calling attention to the sugar-beet business in northern Colorado. It reads like a fairy tale. Only a few of the facts will be necessary to tell the story.

The business was initiated in 1901 with one factory. In that year, 5,600 acres were put into beets, which produced 58,000 tons of beets, making 5,610 tons of sugar. In 1907 there were ten factories; 69,000 acres were cultivated, producing 898,000 tons of beets, making 98,780 tons of sugar. The business now represents fully $25,000,000 of invested capital; yet all this great business is confined to the cultivation of scarcely more than three townships of land, which before its reclamation was too arid to produce even a crop of grass or sage-brush. The sugar business represents intensive cultivation; and the center of the business in the United States is today in the Rocky Mountain States.

The soils of the plains and valleys of the Rocky Mountain States, by the erosion from the mountains, are rich in the salts required to produce plant life. By the utilization of the waters of the streams and lakes in irrigating the lands and cultivating certain crops, such as alfalfa and other clovers and field peas, nitrogen can be drawn from the air and deposited in the soil, supplying the place of the loam found in the soils of the Mississippi Valley. This makes it possible to grow in abundance that variety of crops common to the latitude, and the most necessary ones to meet the demands of the civilized world. The waters return with each coming season, and the more widely they are spread on the land the richer the soil becomes, reversing the conditions in the immediate Mississippi valley.

So it may be said that if we want to conserve our natural agricultural resources in the Rocky Mountain States, we can best do so by reclaiming, irrigating, and cultivating the soil. It is true the forage so useful in the life of the domestic animals is produced naturally in great quantities and annually grazed off, but the forage produced through the reclamation and irrigation on one acre of the same lands is equivalent to the best which naturally grows on fifty acres. The foundation of this improved condition is water. Its conservation so that it can be used when the growing season is at hand and the drouth is imminent is a most valuable accumulated asset and insurance. [Applause]

If you for a minute direct your attention to the map to your right hand, you will notice that the part of the map devoted to Wyoming is marked by dark shading. This shading represents the coal area already discovered in the State. We believe that these discoveries are small in comparison with what will yet be disclosed in the near future. While the State is rapidly becoming one of the foremost in coal mining, the coal fields have not been sufficiently examined to tell where the best coal will be found or in what quantity. We can scarcely say that these great deposits have been wasted. We are now passing through the period of discovery, not exhaustion and waste, in Wyoming.

The steps taken by the Government to conserve the great natural resources are wise. The Government of the United States has undertaken one of the greatest works in its entire history in the reclamation of its arid lands for actual settlers and homesteaders. This course should be pursued until the flow of every stream is controlled and the waters are distributed over the parched lands tributary thereto. This will make it possible to redeem much of the deserts and to provide homes for thousands of farmers. The work is so mammoth that it will take many years to secure the full fruition of what is possible. The process will be slow, yet the results will justify the time and expenditures required.

The red shading on the map shows what the Reclamation Service has done and is doing. The private enterprises, largely under the Carey Act, will amount to as much more. To reclaim these lands the forests found at the head waters of the streams should be conserved. Only the dead timber, outside of trees fully matured, should be removed. The domestic wants of the people who are remote from the great forests should be considered. [Applause]

The timber areas hold back the floods, the forests hold up the snowfall, and in this wise reservoirs are maintained in the timber. These, with the great reservoirs which will be constructed, will in a measure control the waters which annually, in the form of floods, do great damage. If this damage can be avoided, almost any cost of the Reclamation Service will be justified.

I believe the great cattle and sheep ranges should be protected from destruction. The natural grasses are a great resource. They are a significant factor in the meat, wool, and leather supplies of the country. Unless something is done these great grass fields will soon cease to bear their annual full crop of nutritious feed for cattle, horses, and sheep. The Rocky Mountain States and Territories are intensely interested in stock. It is a business amounting annually to many millions of dollars. Wyoming is second to no other State in the production of wool. The sheep business is very large. The cattle and horse industries are scarcely of less importance. The range business is valuable, yet all this business will be small in comparison with that which will grow up with the reclamation and cultivation in the State of six or eight million acres in agricultural crops.

To protect the range lands, a proper leasing system should be inaugurated, and all the lands that can be reclaimed should be parceled out among the people as speedily as possible. The question arises, "How can this be done?" Since the administration of President Jackson, the policy has been not to get revenue out of the public lands but to parcel out the lands among the people who are seeking homes. In this the Government has been very successful. If our forefathers could have foreseen the future, they scarcely could have done the great work better.

There have been all kinds of land laws passed. Good, as a rule, has been the result. Sometimes large bodies of land have been assembled in the hands of the few, but soon this has been divided and distributed. The tendency from the Canadian line to the Mexican border is the division of large tracts into small farms. That there has often been fraud can not be denied. The West has not always been able to wait for land laws to be made entirely to suit new conditions. The people have sinned and been sinned against. The regulations of the Interior Department have been changed many times. These changes have often come quickly. The Homestead and Desert Land laws in operation today are not those that were passed. These regulations often change the laws, yet I believe the best possible results have been attained.

The gentleman who preceded me talked about wars that rage among those engaged in the range business. He should have said the newspaper wars. I have lived in the West many years. I have been interested in the range business. I have not known of these range wars. I have not found it necessary to quarrel with my neighbor, nor has he found it necessary to quarrel with me; much less have I found it necessary to be a party to a war. My experience has been the rule and the same as that of other stock men. The pursuit of a thief is not war. A row between two drunken men is about the same in Wyoming as elsewhere in the world. The disputes among those engaged in the live stock business have been few.

The country is large. The settlements are few. It is not policed. Not one man in five hundred carries arms. The few troubles and the little strife among those occupying the great public ranges are high compliments to the character of those engaged in the range business.

In conclusion I have to say the sooner the forests are fully protected from vandals, from fires, and from overgrazing, the better it will be for the People. That the grazing fields should be controlled there can be no doubt with the right-thinking man; and the sooner every irrigable acre of land can be dominated by the plow of the agriculturist, the better it will be for the new States.

While we may object to some of the regulations and find fault with some of the officers and agents that are detailed to execute the laws and regulations, yet if the Department move in the right way in inaugurating new policies in forest protection and range control, I do not believe it will be five years after the regulations are carried into effect before all parties will approve and applaud and be happy because of the changes.

I thank you, Gentlemen. [Applause]

The Presiding Officer (Governor Deneen): The program has been altered somewhat, and instead of continuing the discussion of western lands we shall hear from Mr J. Horace McFarland, President of the American Civic Association. [Applause]

ADDRESS BY J. HORACE McFARLAND

PRESIDENT OF THE AMERICAN CIVIC ASSOCIATION

Mr Chairman:

I would urge this august and influential assembly to consider the essential value of one of America's greatest resources—her unmatched natural scenery.

It is well that we should here take full account of the peril to our material prosperity which lies in further wasteful depletion of our waning resources of forest and mine, of water and soil. By the possibilities of conservation here discussed, the mind is quickened, the imagination fired. But the true glory of the United States must rest, and has rested, upon a deeper foundation than that of her purely material resources. It is the love of country that lights and keeps glowing the holy fire of patriotism. And this love is excited primarily by the beauty of the country. Truly inspired is our national hymn as it sings:

My native country, thee,
Land of the noble, free,
  Thy name I love;
I love thy rocks and rills;
Thy woods and templed hills
My heart with rapture thrills,
  Like that above.

Paraphrasing a recent utterance of Mayor McClellan on city beauty, I insist that—

"The country healthy, the country wealthy, and the country wise may excite satisfaction, complaisance and pride; but it is the country beautiful that compels and retains the love of its citizens."

We can not destroy the scenery of our broad land, but we can utterly change its beneficial relation to our lives, and remove its stirring effect upon our love of country.

Scenery of some sort will continue as long as sight endures. It is for us to decide whether we shall permanently retain as a valuable national asset any considerable portion of the natural scenery which is so influential in our lives, or whether we shall continue to substitute the unnatural scenery of man's careless waste.

Shall we gaze on the smiling beauty of our island-dotted rivers, or look in disgust on great open sewers, lined with careless commercial filth, and alternating between disastrous flood and painful drouth? Is the Grand Canyon of the Colorado to be really held as Nature's great temple of scenic color, or must we see that temple punctuated and profaned by trolley poles? Shall the White Mountains be for us a great natural sanitarium, or shall they stand as a greater monument to our folly and neglect?

It is certain that there has been but scant thought given to scenic preservation hitherto. I remember the contempt with which a lawyer of national renown alluded to the absurdity of any legislation by Congress in preservation of scenery, when, in response to the demand of the People, that body had chosen to give a measure of temporary protection to a part of Niagara's flood. [Applause]

Indeed, one of the potent forces of obstruction to the legislation now demanded by the country in belated protection to the almost destroyed mountain forests of the East has expressed itself in a contemptuous sneer at the very idea of national expenditures for the preservation of scenery.

Mr Chairman, we meet in a historic place, in a historic city. The Father of our Country was not only great in war and statesmanship, but great in esteem for natural beauty and in the desire to create urban beauty. George Washington loved the beauty of scenery, and his wisdom has provided, for all the world to see, a Federal city admirable in its adaptation to the public needs, and destined, as his plans are carried out, to be beautiful beyond compare.

What is the effect of the scenic beauty of Washington on the citizens of the Nation who come here? Is not their pride awakened, their patriotism quickened, their love of country increased? Consider wealthy Pittsburg, busy Cincinnati, with their wasteful smoke, their formless streets, their all-pervading billboards and grime—would one of these serve to stimulate love of country as the National Capital?

No; the unthinking and ofttimes unnecessary ugliness of civilization does not foster patriotism, nor does it promote the health and happiness which are at the very basis of good citizenship. When, in looking over the horrors of industrial civilization, William Morris urged humanitarian effort—

> "Until the contrast is less disgraceful between the fields where the beasts live and the streets where men live,"

he brought out a bitter truth. We have made our cities ugly for the most part; but we are learning the basis of happy citizenship, and while we can not altogether make over these centers of population we are bringing into them the scenic suggestion as well as the physical facilities of the open country—in our parks. In these parks lies the answer to the ignorant contempt for scenery to which I have alluded; for it is incontrovertible that peace and health and good order are fostered in parks in proportion as they represent scenic beauties.

Mr Chairman, there is, too, a vast economic reason for jealously guarding all of our scenic heritage in America. Visiting a quiet Canadian community on the shore of Lake Ontario a few days since, I was impressed by the number and the beauty of the summer homes there existing. Inquiry brought out the astonishing fact that they were almost exclusively owned by residents of a certain very wealthy and certainly very ugly American city where iron is king. The iron manufacturers flee from the all-pervading ugliness they have created, and the money they have earned in complete disregard of the naturally fine scenic conditions about their own homes is used in buying scenic beauty in a foreign country! Perhaps a certain form of needed protection is here suggested! [Applause]

It is authoritatively stated that the tourist-travel tribute paid annually to Europe exceeds half a billion dollars. Of this vast sum America contributes a full half, getting back a far smaller sum in return travel from all the world. No one will suggest that there is travel to Europe to see ugly things, or wasted scenery. No; this vast sum is expended almost entirely in travel to view agreeable scenic conditions, either natural or urban. The lumber king leaves the hills he has denuded into piteous ugliness, and takes his family to view the jealously guarded and economically beautiful Black Forest of Germany. [Laughter] The coal operator who has made a horror of a whole country-side, and who is responsible for the dreadful kennels among the culm-banks in which his imported labor lives, travels through beautiful France, or he may motor through the humble but sightly European villages from whence came his last invoice of workers.

Every instinct for permanent business prosperity should impel us not only to save in their natural beauty all our important scenic possessions, but also fully to safeguard the great and revolutionary development almost certain to follow this epoch-making Conference. We are assured by experience that the use of our great renewable resource of soil fertility is attended with the continuance of beautiful scenic conditions. The smiling farm, the glowing orchard, the waving wheatfield, the rustle of the corn—all these spell peaceful beauty as well as national wealth, which we can definitely continue and increase.

Can we not see to it that the further use of our unrenewable resources of minerals and primeval forest is no longer attended with a sad change of beautiful, restful, and truly valuable scenery into the blasted hillside and the painful ore-dump, ugly, disturbing, valueless?

The waters of our streams must furnish the "white coal" of the future and electrically turn the wheels of commerce in smokeless economy. Such a change can consider, retain and sometimes increase the beauty of the scenery; or it can introduce the sacrilegious ugliness of which the American gorge at Niagara is now so disgraceful an example. The banks of the waterways we are to develop can be such as will attract scenic travel rather than repel it. [Applause]

We can not, either, safely overlook the necessity for retaining, not only for ourselves but for our children's children, God's glory of mountain and vale, lake, forest and seaside, His refuge in the very bosom of nature, to which we may flee from the noise and strain of the market-place for that renewing of spirit and strength which can not be had elsewhere. True, we can continue and expand our travel tribute to the better scenic sense of the Eastern World; but that will not avail our toiling millions.

> Beauty for the few, no more than freedom or education for the few,

urges William Morris; and who shall say that our natural beauty of scenery is not the heritage of all and a plain necessity for good citizenship?

Every one of us recognizes the renewing of strength and spirit that comes from even a temporary sojourn amidst natural scenic delights. The President has but just returned from a "week-end" visit to his castle of rest in the Virginia Hills. Could he have had equal pleasure in Hoboken? [Laughter] Mr Carnegie's enterprise built Homestead—but he finds the scenery about Skibo Castle much more restful!

Who of us, tired with the pressure of Twentieth Century life, fails to take refuge amid the scenes of natural beauty, rather than to endeavor to find that needed rest in a mining village? The most blatant economist, who sneers at the thought of public beauty for all, is usually much interested in private beauty of scenery, of home and of person, accessible to him alone. Selfishly and inconsistently he recognizes in his own use the value of the natural resources he affects to despise!

I am convinced that the majority of my countrymen hold deep in their hearts sentiments of regard for the glorious natural beauty of America. If to my inadequate words there be any response among those here present, there may be future action.

May I, in conclusion, but hint at some things that might well result?

First, we must hold inviolate our greater scenic heritages. All the nations visit the Falls of Niagara as the wonder of the Western World; yet we are even now engaged in an attempt to see how closely we can pare its glories without complete destruction. Eminent authorities warn us that the danger line is now passed, and that a recurrence of a cycle of low water in the great lakes may completely extinguish the American Fall. A hundred other water-powers in New York and Ontario would together give as much wheel-turning electric energy, but all the world can not furnish forth the equivalent of Niagara in beneficent influence on the minds of men, if held as a scenic heritage. The glory of Niagara today hangs by a hair—and millions of money seek covetously to cut the hair.

The National Parks, all too few in number and extent, ought to be held absolutely inviolate, as intended by Congress. The Hetch-Hetchy valley of the Yosemite region belongs to all America, and not to San Francisco alone.

The scenic value of all the national domain yet remaining should be jealously guarded as a distinctly important natural resource, and not as a mere incidental increment. In giving access for wise economic purposes to forest and range, to valley and stream, the Federal Government should not for a moment overlook the safeguarding to the People of all the natural beauty now existing. That this may be done without preventing legitimate use of all the other natural resources is certain.

The Governors of sovereign States here assembled, the many organizations here represented, possess the power and have the opportunity so to change and guide legislation and public opinion as to foster the underlying desire for public beauty, both natural and urban. We have, for a century, Mr Chairman, stood actually, if not ostensibly, for an uglier America; let us here and now resolve, for every patriotic and economic reason, to stand openly and solidly for a more beautiful, and therefore a more prosperous America!

The PRESIDING OFFICER (Governor DENEEN): Governor Folk is called for, and has the floor.

ADDRESS BY JOSEPH W. FOLK

GOVERNOR OF MISSOURI

Mr Chairman and Gentlemen:

I rise principally to carry out a suggestion made to me by a number of Governors. I was requested to suggest that after this meeting closes the Governors remain for the consideration of some matters that can not properly come before this Conference at the present session. I am sure that every Governor feels that he has been benefited by the proceedings of this Conference thus far. As has been remarked by a number of the gentlemen, this meeting is world-wide in its influence. It would not have been possible for so many Governors to have come together in any other period of American history. Prior to the Civil War the transportation facilities were not sufficient. After the Civil War the feeling between the sections was not such as would make such a meeting very harmonious or very happy. But we have met here now as one large family. [Applause]

In looking at the map on the wall before us I have been impressed by the fact that the States in this Union are, after all, closely connected in blood and in interest. There is Tennessee, my native State, made up largely of people from North Carolina and Virginia; Missouri, my adopted State, composed largely of Kentuckians, Tennesseans, and Virginians;

Texas, made up of Missourians and Tennesseans, with others from the older States; Oklahoma, made up chiefly of Texans, Missourians, Tennesseans, and Kansans. And so it is that all of the American States are now united in purpose and joined together by patriotic bands into a common country. What concerns one is the concern of all; the achievements of one are the glory of all. [Applause]

The People of the United States, whether from North, East, South, or West are alike. The good men and women are the same everywhere, and the bad people are alike wherever they may be found. In all of the American States, honest blood is loyal blood, and manhood is the only patent of nobility. [Applause]

It does not matter so much where a man is from and what that man is. In the language of Kipling:

> There is neither East nor West—
> Border, nor breed, nor birth—
> When two strong men stand face to face,
> Though they come from the ends of the earth.

In this Conference, if I had any criticism to offer it would be this. We have not heard from as many of the Governors as perhaps should have spoken, not theoretically but giving us the benefit of their actual experiences. Perhaps I could criticise myself in that regard.

Take the questions we had up yesterday, the subject of mines, or the subject of reclamation of lands. In Missouri, in the southeastern portion of the State, we have reclaimed more than 500,000 acres, by a drainage system, at an average cost of $12 an acre; and that land a few years ago was worthless. Today it is as rich as any land in all the world. [Applause]

I was impressed by what Mr Mitchell said yesterday on the subject of mines, and by what Mr Carnegie and Mr Hill had to say on the same subject. In Missouri we produce something like $8,000,000 worth of coal a year; but 26,000 square miles of Missouri soil are underlain with coal deposits of an approximate value of $200,000,000,000. So it will take at the present rate of mining something like three thousand years to exhaust the supply that we have under that soil.

Therefore I see no necessity for immediate apprehension on the subject of the exhaustion of the coal supply. These natural resources should be conserved, but the coming generation can meet that problem. We have other problems before us that we must meet and settle now.

The forestry question is our problem, and it is a problem that we must settle, and settle soon. [Applause]

The waterways question is our problem, and if we do not settle it we will fail in our duty, not only to the present generation but to those who may come after us. [Applause]

Governor Glenn this morning spoke of a bill before Congress in reference to forestry and waterways. I want to endorse what Governor Glenn said. The Newlands bill ought to pass Congress. [Applause] He again spoke of *vox populi, vox Dei*. But there is a new voice in the land that was not contemplated by the Fathers of the Republic—*vox Cannoni*. [Applause and laughter] And this last voice has often proved more powerful than *vox populi*, and it sometimes seems to think it is greater than *vox Dei*. [Cries of "That's so"]

We want to put our forests in proper condition to preserve those we have, and to adopt a scheme of reforestation. In Missouri we have no State forester, but as soon as I go back I am going to appoint a State Forestry Commission. [Applause and cries of "Good" "Good"] I believe every Governor ought to do the same thing, and I am sure that his State Legislature when it meets will ratify his action.

We want to preserve our forests. Now, I hope I am not encroaching upon forbidden ground, but I have been wondering why, if it be so necessary to preserve our forests, it would not be a good idea to put lumber on the free list—make lumber free. [Applause] I hope that is not heresy. It seems to me that for every foot of lumber brought here from another country we preserve a foot of lumber in our own forests.

Mr LONG: I would like to answer that right now——

Governor FOLK: Not right now, Mr Long; my time is limited.

The tariff on lumber instead of protecting our own forests has the effect of destroying our forests.

I note that my time has expired, and I will ask your indulgence only a little further. I wanted to speak one moment on the waterways.

You will notice on that map St. Louis on the eastern side of Missouri, and Kansas City on the west. You will see through the center the blue line marking Missouri river. We are now contemplating the building of a great highway from St. Louis to Kansas City, and were there no navigable waterways between those points the project of building a canal would be seriously considered. But nature has already provided a magnificent waterway that needs only to be improved to make it one of the great arteries of commerce of the Nation. [Applause]

This river, as well as all other navigable waterways, belongs, I believe, to the Federal Government. I think it is the duty of the Federal Government to improve these waterways and make them adequate for commerce. [Applause] The proposition as to the ownership of navigable waterways was debated the other day in the Senate. Some took the position that navigable waterways really belong to the State, and the Federal Government only has an easement in them for the purpose of navigation. But if the State of North Carolina—we have had some experience along that line—or the State of Missouri were to attempt to improve one of these navigable waterways, I am afraid the State officials would soon find themselves in jail for interfering with navigation. What to a State official might seem an aid to navigation might to the Federal official seem an obstruction to navigation. The States must obtain the consent of the Federal Government before anything can be done by the States to improve the waterways, and since that consent has to be obtained the Federal Government is in fact the owner, if not in theory at least practically speaking.

Now, I propose this. Since the Federal Government has neglected that magnificent stream that drains the richest freight-producing country in all the world, that the Federal Government either immediately proceed to put that waterway in such a condition that it can be used for our commerce; or, if the Federal Government does not desire to do that, then if by act of Congress the Federal Government will permit the State of Missouri to use the water power from Missouri River, the State of Missouri will guarantee to put it in proper condition by the revenues derived from the sale of the water power. [Applause]

And not only that, but we can obtain sufficient revenue to run our State Government in addition. Mr Smith of St. Louis, the President of the Business Men's League—are you here, Mr Smith?

Mr SMITH: Yes.

Governor FOLK: Is that proposition satisfactory to the business men?

Mr SMITH: Entirely so.

Governor FOLK: I believe each State would make that proposition. So let the Federal Government either improve these waterways or give the States permission to do so and use the water power. I believe we are entering on an era of prosperity such as this Nation has never known before. With the completion of the Panama Canal the world will be the business field of our great industries, and with restrictions on trade removed it takes no prophetic eye to look into the future and see for the United States a pre-eminence in industrial activity never before attained. [Applause]

It is no idle assertion to say that the United States is destined to dominate the commerce of the modern world, even as Rome and Carthage were the commercial mistresses of the world of Hannibal and of Scipio; but those two great city-states had but a single coast, both were on the shores of but a single sea, while the United States may lay a mighty hand on either ocean at will, and dominate the southern seas as well. I believe we may confidently look forward to a day of universal peace when the nations of the earth will be knit together in commerce and in brotherhood. When that time comes the rivers of the United States will be filled with craft of every kind, carrying the products of farm and of mine and of factory across the seas into every land beneath the sun, and returning to pour into the lap of the Nation the golden stream of universal trade. I thank you very much. [Loud applause]

Mr Osborn: Mr President, I rise to a question of information.

The Presiding Officer [Governor Deneen]: The gentleman is recognized.

Mr Osborn: I want to give the Conference the inspiring information of the first fruits of its efforts, the first actual practical effect of the splendid work that has been inaugurated here.

You will remember the emphatic and dramatic manner and the satisfactory terms in which the President of the United States referred to the Inland Waterways Commission. The Senate Committee on Commerce, which had under consideration the waterways bill, has reported it out favorably, within the last half hour, [applause] carrying money for its permanent maintenance; declaring that it shall have an office in Washington, that its membership shall be nine, appointed by the President, and that it shall have a free and untrammeled field in the future for the great work that we hope it will do. That is a practical result; and we want practical results in this Conference. [Applause] We don't want to send out a message to the world of hopelessness or pessimism. We want to tell the people that the time is ripe to do things, not yesterday but today; that it is the genius, the patriotism, the vitality of our people, of all our country, from the top to the bottom, from each side to the other, that are aroused; and we will do the things that we have to do.

Another practical result—and I think there will be many very soon—was the declaration made by Governor Folk that everybody applauded so splendidly that he is going home to appoint a State Forestry Commission. Let us all go home and do something equally good, or as near as we can come to it. [Applause]

The Presiding Officer: I want to congratulate Governor Folk on the results that are following so closely on his speech.

Governor Brooks of Wyoming is recognized.

ADDRESS BY BRYANT B. BROOKS

GOVERNOR OF WYOMING

Mr Chairman, Governors, Gentlemen:

I will try and keep safely within the five-minute limit. I simply want to follow the advice just given by the Governor of Missouri, and express briefly the sentiments of the western people relative to this great question. I speak from personal experience, and believe in doing so I but voice the sentiment of a great majority of the western people.

Your attention has been called to the State of Wyoming. I ask you to notice also that it is one of the squarest States in the Union; [applause] that its people, blessed by a mile-high altitude, perfect climate and woman's suffrage, face four-square to all the world.

No State in the Union has more undeveloped natural resources. Our pine timber covers an area larger than the State of Massachusetts. Our coal deposits underlie territory greater than Vermont and New Hampshire. Our oil fields are more extensive than the oil fields of Pennsylvania or Ohio; and our vast iron deposits, many of them beyond the reach of transportation, have all been analyzed and found superb.

My people want the conservation of natural resources along the lines outlined so splendidly by the President yesterday. We want the conservation, but not stagnation. We want the conservation of natural resources which means the intelligent exploiting of those resources, thereby sensibly preventing waste by both producer and consumer.

I want to set myself right before the Gentleman from New York. The people of the west favor forest protection and want reforestation on burned-over and waste areas, but we also want fairness. I was delighted to hear the Governor from Missouri say he is going home to appoint a forestry commission. We want a forestry commission in every State of the Union, and we want State protection of our forest reserves as far as possible.

We also need this National Forestry Association; but we would like to have it conducted more along the lines followed by the Agricultural Department. [Applause] Let the National Association send experts into every State to ascertain what is necessary to kill the bugs that are destroying the trees, to find the trees best adapted to the soil. But it is not right to Wyoming, with one-sixth of its area taken up by National Forests, or to Idaho with nearly one-fourth of its area taken up by forest reserves, or to Montana, with one-fifth of its area taken up by forest reserves, to be taxed to support a national association that is doing work down in the Empire State of New York free of cost.

The Governor of New Jersey said they did not have to levy any taxes for State development. Out West we necessarily tax our people to the limit, and last year Wyoming people also paid over $150,000 for grazing privileges and logs and lumber brought out from the forest reserves which should go to our settlers absolutely free. This tax on Wyoming forest reserves was partly used to protect forests in the State of New York. You certainly should pay your share toward forest preservation.

We want this National Forestry Association to be great and strong, but we want it fair throughout the country. Let all contribute alike, just as the money is raised to run the Agricultural Department.

Just one other word. The mention was made in some paper here a moment ago about Government control of the open ranges. Wyoming spends thousands of dollars yearly trying to get new settlers. That is the best conservation, the very best of all. We invite the settlers, and our land offices are busier now than ever before. We ask you, Gentlemen, not to lay any burden upon us that would prevent the settlement of that great young State. We want the people to come out there and become as one with us. I thank you. [Applause]

The Presiding Officer (Governor Deneen): Governor Cutler of Utah is recognized. [Applause]

Address by John C. Cutler

GOVERNOR OF UTAH

Mr President and Governors:

I come from the part of the country that used to be called the "wild and woolly West." I can not say that we are wild out there, but I know that we are woolly, for we have flocks on our thousand hills. [Laughter]

In listening to one of the previous speakers in regard to our sending ~~half a~~ billion dollars out of this country sightseeing in Europe, I am reminded of a saying that originated I think with one of our citizens in Utah, which I believe has kept, during the past year, about as much more from leaving America. The saying is, "See Europe if you will, but see America first."

Utah's interest in the subject before this Conference is similar, of course, to that of the other States. Yet like every other State it has its distinctive problems of waste and economy.

Our State was virgin soil a little more than sixty years ago. All development in agriculture, mining, forestry, stock-raising, and every other direction has taken place since that time. In comparison with some of the Commonwealths here represented, Utah has only commenced its work. And yet the tendencies toward waste of resources, which other peoples say are characteristic of the American Nation, are pronounced in Utah. The only difference is in the fact that they have not been in operation quite so long.

Taking up in order the different resources requiring conservation, I will speak first of the soil. In Utah it is vigorous and fertile. It has the strength of youth. While the soil of many of the other States has been supporting life for centuries, that of Utah has been storing up vitality and vigor. Land in all the States has been misused, I presume, through the planting and reaping of crops without adequate compensation in the way of fertilizing. But this process has not been going on quite so long in Utah. We are equally guilty in the act, but not quite so in extent of time.

Then there are vast stretches of plains and valleys in Utah which have not yet been touched with a plow. The soil is as fertile as any that has ever been used. But water is not available; and arid farming has not yet been sufficiently developed to permit these lands to be used. Out of the something more than 54,000,000 acres of land in Utah, about 20,000,000 consist of mountains and lakes; and approximately 12,000,000 acres are coal and salt and similar lands. Of the remaining 22,000,000 acres, only 2,000,000 are now irrigated, and it is probable that not more than 5,000,000 additional acres can ever be irrigated. This leaves practically 15,000,000 acres of excellent soil that can be utilized agriculturally only by the "dry farming." And this is good arable land, capable of producing splendid crops if we can only get the secret of securing them. As only a hundred thousand acres or so of this land can be said to be under full arid cultivation, you can readily understand the interest the people of Utah take in the demonstration the Government is making of the best methods to be pursued in dry farming and in preserving the fertility of the land.

As to forests, Utah is peculiarly situated. All the natural trees of any value as timber are on the tops and slopes of high mountains. The timber at all easy of access has been almost totally used. That remaining is very hard to get at. Utah has eighteen National Forests, with a total area of 7,415,832 acres. It is estimated that it would be well to place under forest regulation no less than 1,500,000 acres more; but half of this is under private ownership, and can not be secured by the Government except by purchase. The conservation of these forests serves a double purpose; it preserves the timber from destruction, and protects the water supply. [Applause]

For water for irrigation and culinary purposes the people depend almost wholly on the winter snow-fall. Where the mountains are covered with forest growth, the ground is softened and made pervious to the water. Sinking into the ground, the water forms numerous springs below, and these feed the mountain streams. Where the timber growth is heavy, the snow is prevented from melting too rapidly and producing disastrous freshets in the spring. So that from every point of view it is desirable that our forest reserves shall be kept intact.

The timber in these reserves totals about 5,000,000,000 feet. Until the strict supervision of the Government was exercised over these lands, disastrous forest fires were of frequent occurrence; and millions of feet of good timber have been destroyed in this way. But by natural and artificial reforesting, these lands can be largely replenished with timber.

On the matter of reforesting I am informed that already some 2,400,000 trees have been raised in a Government nursery to a point where they will be ready for planting in the forests next year. And I am informed that it is the intention to increase the capacity of the tree-planting station to about 2,000,000 trees a year. For the present, most if not all of this planting is for the purpose of preserving the watersheds.

Our forests form our watersheds. At this point the question of grazing—a rather vexed one, by the way—comes in for consideration. Without attempting to discuss the matter, I would merely suggest that for the present it seems to me that we should err in being too strict rather than too lenient. While we desire to protect the live-stock interests, our agricultural interests are of first importance. I think it will be well to restrict the number of cattle to be grazed on the reserves to their actual carrying capacity, so that the range will be kept in at least as good condition as at present.

Regarding grazing on the land outside the reserves, I am informed that some stock interests are abusing the range, especially by moving their stock from place to place to the injury of local stockmen. National legislation I think should be enacted, providing for the protection of these ranges by making it possible for bona fide settlers to secure the land in a certain vicinity for exclusive grazing, thus encouraging the sinking of wells and the employment of other means of securing water for their stock. It is to be hoped that before long the conflicting interests involved in this question of grazing can be brought together in a common and satisfactory understanding so that the rights of each can be protected. This strikes me as a very appropriate question for discussion and action at this Conference.

In Utah, as much as in any of the States and more than in most of them, the preservation of the water means the making of the land. I may illustrate this by referring to the one great reclamation project which the Government has undertaken and is carrying on in Utah, the Strawberry project. Water is to be brought a distance of more than thirty miles, passing through a tunnel nearly four miles long, to reclaim 60,000 acres of arid land. The cost of the project will be about $40 an acre; but the value of the land will be increased about $100 an acre. It is as good an investment as I have ever heard of. But the reclamation of the land is only one feature. The water has a total fall of about three thousand feet, and the opportunity for power plants in the course of this fall is almost unlimited. Then the water is brought from a cold and comparatively unfruitful region to a valley so much warmer, by reason of being so much lower, that crops practically impossible in the upper valley can be raised by irrigation in the lower. This is one project. I am sure that others of similar value can be successfully established in our State. And there is no more effectual way of preserving our resources. [Applause]

I had the pleasure on the first of this month of visiting this great irrigation project. I was struck with the thorough way the Government has of doing things; and the advantage of entrusting these great projects to a disinterested Government instead of having them in the hands of interested private parties, who would be tempted to make money by charging the farmers many times over the cost of the water.

In addition to this Government project, the State is financing, either by loan or by direct provision of funds, five or six projects involving the reclamation of some 100,000 acres. These will practically exhaust the State funds available for this purpose for the next two years. At that time other funds will come in, and there will be a repayment of a portion of the money now being expended. And then other projects may be commenced. But the State will always be at a disadvantage on account of limited funds.

The minerals of Utah form a very large portion of its wealth. There seems to be an idea that it is desirable to dig the minerals out of the ground as rapidly as possible. For this purpose hordes of foreigners have been brought into the State in recent years, and our mines have been gutted at a ruinous rate. There is no objection to the rapid enriching of the mine owners; but it seems unfortunate that a large part of the proceeds of the mines should be carried away by those who have no permanent interest here, and who merely earn the money in America for the purpose of spending it in Europe. These remarks apply rather more to metalliferous than to coal and iron mines.

Our coal fields are supposed to total nearly 2,000,000 acres. New fields are being opened each year. The conservation of these mineral lands has not been very carefully regarded until within the past few years. Those belonging to the State were sold at a ruinously low figure, and thus valuable public properties have been frittered away. But of recent years it is becoming the policy of the State to charge a higher price for mineral lands and even for those lying in the vicinity of mineral belts. And so far as I am concerned, I should be in favor of leasing coal lands instead of selling them at all.

In the southern part of the State especially we have large stretches of iron lands, estimated to cover 155,000 acres, and containing, I am informed, eight different varieties of hematites. These lands we hope to preserve in large part until through public and private enterprise we may soon have a second Pittsburg in Utah, in respect to the production of iron and steel. This can best be accomplished through railroad extension and the encouragement of capital: two things that the loyal citizens of Utah are hoping for.

The precious metals cover an area, mostly mountainous, of over a million acres. Here are fabulous deposits of gold, silver, copper, and lead. I am told that scarcely one-third of this vast area has even been prospected. An area of 75 by 40 miles is covered with hydro-carbons, such as gilsonite, elaterite, asphaltum, etc. The supply is practically unlimited. Among the coal reaches is to be found, I am informed, the only cannel coal in the west.

Summing up all that has been said, and much more might be added, I would say that the wealth of Utah has just begun to be developed. From a total of $412,000,000 in 1900, it has steadily increased to $546,000,000 in 1907. For every million dollars the Government spends in reclamation projects, the property of the State will increase, I think, at least three millions. And in addition, the money expended by the Government will be repaid according to the terms on which it is advanced. And when the 20,000,000 acres of redeemable land are added to the little over 2,000,000 acres already under cultivation, the wealth of the State and its power of annual production will have been multiplied over and over again. While this wonderful increase of wealth is going on, it is the aim of the citizens of the State to conserve its wealth and resources and avoid the destructive extravagance which young communities, like young men, are likely to be guilty of when they contemplate a fabulous increase of wealth.

On one matter I wish to express the thanks of the State of Utah to President Roosevelt. As you know, Utah has a great number of objects of scientific and scenic interest, both natural and artificial. Among these are the great bridges thrown by nature over immense chasms in southern Utah. These are three in number. The largest is 222 feet high, and has a span of 268 feet. Its arch is 157 feet in height. The next largest is 205 feet high, the archway having a span of 186 feet and a height of 98 feet. Even the smallest is a massive piece of nature's handiwork, 118 feet high with an archway spanning 194 feet, and clearing 108 feet above the stream it spans. The thanks of the people of Utah are extended to the President for his forethought in setting the ground surrounding these bridges aside as a national park. It is all the more appreciated from the fact that the country round about is dotted with the ruins of cliff-dwellings and with picture writings that need protection from vandalism fully as much as the natural bridges.

Another matter is closely related to this. As you are aware, the American bison has long been in danger of extinction. There is in Great Salt Lake an island some 30,000 acres in extent, where the bison thrives and multiplies. A herd of forty of them is kept there. The bison and part of the island are under private ownership.

The great broad principle underlying the subject of conservation is whether or not each succeeding generation can be sustained on the land without impoverishing it in any respect. Stated as a question it is, "Will each generation leave the land as rich as the preceding one?" It seems a simple question, and yet the safety and even the lives of our children and our children's children will depend on the answer. The forests, the streams, the soil, the minerals, and all the other natural elements of wealth should remain as nearly as possible undiminished as the centuries pass. All of this is in the hands of the People, with the possible exception of the preservation of the mineral wealth.

Soil impoverished by crops can be enriched with fertilizers. Forests depleted by the lumberman or fire or decay can be replenished by the skillful forester. Water turned from its natural channel to sink into the thirsty ground can be augmented by the bounty of our Government in reclamation projects. Grazing lands made bare by the flockmaster can be restored to greenness by strict regulation and natural growth. Hence I think that nearly all the elements of natural wealth our country is blessed with can be husbanded and preserved, so that our succeeding generations can not justly rise up and censure us for bequeathing to them a bankrupt patrimony. It is the laudable desire of President Roosevelt and his associates to aid in this work of conservation. So far as I am concerned, Gentlemen, I am going to give him my loyal support in this undertaking. [Applause]

The PRESIDING OFFICER (Governor DENEEN): Governor Gooding is called for, and is recognized.

ADDRESS BY FRANK R. GOODING

GOVERNOR OF IDAHO

Mr President and Gentlemen of the Conference:

I have been deeply moved by the great papers and addresses that have been presented before this body. In my judgment, no citizen can perform a greater service to his country than by assisting in laying the foundation of a work that will protect and bring about the fullest use and the highest possible development of all our great natural resources.

We have built here a great Nation without a thought of tomorrow. We will grow still greater, even if we follow the same old methods that we have followed in the past, but we can not reach our full share of greatness as a Nation unless, before it is too late, we throw safeguards around those resources that have made us the mightiest Nation on the earth, and protect and conserve them so they may be developed to the fullest extent for the benefit of this and future generations. [Applause]

This work of laying the foundations of a greater Nation should receive the support and encouragement of all the People of the United States.

But by whom, and how best, can this work be accomplished? This is the great question that confronts the American People. To bring about the best results there must be a cooperation of all the People, more especially those in the States and Territories wherein lie the national forest reserves. Too much care can not be given to the interests, the liberties, and the rights of the People of those States that have given up so much of their domain to the national forests. They have a right to insist on the fullest use, in an intelligent way, of all the great natural resources which lie within the borders of their respective States. It is in the use and development of our great resources that lie the hope, the pride, and the ambition of the People of my State, to build up one of the greatest Commonwealths in the Union. [Applause]

In this great work there is enough for us all to do. Some of it is of necessity national in its scope. The work of improving our large rivers for navigation can best be done by the general Government. [Applause] But that which lies wholly within the borders of one State, can, in my judgment, with the passage of proper laws by Congress, be best done by the People of that State. We need the strong arm of the general Government in the initiation of this great work, but, if it is to be successful, the State must be made an interested party in the administration and development of its own resources.

Idaho has given a practical demonstration of what a State can do for the development of its own resources, in the reclamation of its desert lands, and the storage of its flood waters, under the law known as the Carey Act, passed by Congress in 1894, giving to each State in the arid portion of America a million acres of land to be reclaimed under State supervision. Idaho has demonstrated beyond the question of a doubt that the people of a State are best fitted for the development of their own resources. The work of reclamation of arid lands by the general Government and by the State lie side by side in Idaho, where the Government has done a great work, for which we are all thankful; yet, valuable as this work is, the State, in the same length of time, and under the same conditions, has brought about a state of development many times as great as that accomplished by the general Government. Idaho has constructed under the Carey Act the largest irrigation canals in the world, with the exception of those built by the British government in India and Egypt. The State has built and has under construction irrigation works that will reclaim more than a million acres of desert land, and is now asking the general Government for two million acres more, under the Carey Act, to continue this great work of home building.

Idaho is justly proud of her great development under the Carey Act. Within the last four years we have turned water on more than 300,000 acres of what was then a barren waste, and transformed it into fields of beautiful grass and waving grain. We have made possible the building of homes for more than 60,000 people, and have created a new wealth for the State of more than $50,000,000. Yet in this work of home building, the State has only made a beginning. Within the next five years Idaho will have completed all of its irrigation works for the first million acres of Carey lands, thus giving an opportunity for homes for more than 250,000 people, and creating wealth in excess of $500,000,000. The State of Idaho will continue this great work until all its arid lands are reclaimed and every acre made available and beneficial to mankind. When the story can be written of Idaho's development by irrigation it will tell of the reclamation of more than 5,000,000 acres of as rich land as can be found anywhere in the world. It will be land that will equal in productiveness 20,000,000 acres in the eastern States, for under irrigation there are no failures or half-crops, but every year a full harvest for the man that tills the soil.

Idaho is especially fortunate in its natural waterfalls. I feel that I can say we have more opportunities for the development of power than any other State in the Union. The work of developing our water power by the construction of great plants is going hand in hand with the reclamation of our arid lands. The State is not only reclaiming its arid lands, but has entered into contracts for the construction of large storage reservoirs that will control the flood waters of some of our rivers. Within the next ten years my State will have under control all of its flood waters, which will be used for reclaiming our desert lands. This will be a great relief to the people who live in the lower valleys through which these rivers empty into the sea.

What Idaho has done and is doing in reclaiming her arid lands and controlling the flood waters of the State, it can do in the protection of the forest and the range. The People of Idaho fully understand the importance of the forests. They know that the forests conserve the waters that are as the life blood of the State, and if they are given an opportunity they will conserve and protect the forests for all time—consistent with an intelligent use by the People. Idaho has already passed a law for the protection of her forests on State lands. The law provides that, wherever the land is more valuable for forest than for home building, the timber shall be cut under State supervision, looking to the protection of the young trees, and throwing such other safeguards around it as will insure its success as a State forest. In my judgment, the interests of the whole country would be best served if Congress would turn over to the States all of the public domain, under proper laws looking to the protection of the forest and the range, to be administered and developed by the citizens of those States. I have become very much alarmed of late at the public sentiment growing against the administration of the national forest reserves in my State, for I know their administration can not be successful without the support of the people. There are good reasons for this adverse public sentiment, for at times proper consideration has not been given the rights of the people. Great tracts of land have been included in the reserves upon which there is no forest, nor ever can or will be a forest.

More of the area of my State is in national forest reserves than that of any other State or Territory in the Union. Forty percent of my State is today in national forest reserves, an area greater in extent than is embraced within the States of Massachusetts, Connecticut, Rhode Island, Maine, Vermont, New Hampshire, New Jersey, Delaware, and the District of Columbia. In all the national forest reserves in the United States we have an area almost as great as was embraced within the thirteen original States. These great reserves extend from the borders of Mexico on the south to the British possessions on the north. The varied conditions that of necessity exist over this vast extent of territory make it impracticable, in my judgment, to accomplish the best results by its administration here in Washington.

The man is not yet born that can prescribe rules and regulations for the successful administration of so vast a territory as this, for in no two States in the Union are conditions the same. What might be practical in one State might be ruinous in another. I have seen much of the administration of the national forest reserves in my State during the past few years. I have been its friend. I have given it my support, hoping it meant something for the advancement and development of Idaho; but after more than three years of close observation, I am forced to the conclusion that the theory is all wrong, and that the work the Government is trying to do properly belongs to the State.

I have a high regard for the Chief Forester. He is trying to do a great work, a work that must be done, but it never will be successful until the States are made interested parties in the development of their own resources. I know of no reason why the States should not be entrusted with the protection and development of all the natural resources that lie within their borders. The West is not lacking in intelligence, in courage, in patriotism, or in appreciation of the marvelous resources that a kind Providence has given us with so generous a hand. Idaho is asking for an opportunity to develop her own resources. We desire the assistance of the general Government, not its guardianship. Idaho is asking for the same spirit of the Constitution that has been given to all the States east of the Rockies, and her citizens will demonstrate to the whole world that she is worthy of Statehood. [Applause]

The PRESIDING OFFICER (Governor DENEEN): Governor Norris of Montana is recognized.

ADDRESS OF EDWIN L. NORRIS

GOVERNOR OF MONTANA

Mr Chairman and Gentlemen:

You doubtless all have heard of Montana as an icebound State that produces chiefly icebergs, cold weather, and blizzards. If you have so heard, you have been absolutely misinformed. It may not be quite so warm in Montana at all times as it is here in Washington today, but our State certainly has a most excellent climate.

Montana is populated by as progressive, as intelligent, and as patriotic a people as there are on earth. A large proportion of our people came from the East. They were born and bred and brought up in the old commonwealths of the Eastern section of the Union, and we feel pride in the fact that the East has contributed some of its best blood to the development of our splendid State. [Applause]

We do not object to those spots on the map showing national forests, although they represent 21,000,000 acres in Montana; we would not blot them out. [Applause] But I would suggest, Mr Secretary of the Interior, that there be no more. We have sufficient. We favor forest reserves, not because they will protect the soil—our soil does not wash away; not for the lumber which you gentlemen seem largely concerned about, but is not to us of supreme importance—although we are just as much interested in that as you are—but we want forest reserves to protect the forests because the forests preserve the watersheds. They give us water for the reclamation of arid lands; and Montana generally, although heretofore known as a great mining State only, will in a few years be known as one of the great agricultural States. [Applause]

When I hear you gentlemen talk of producing ten or fifteen or twenty bushels of wheat per acre, I am moved to say that I should like to take you into the Judith basin in our State, where last year they produced sixty bushels of wheat to the acre, and were not specially vain of that yield either. With irrigation we can produce 100 to 125 bushels of oats to the acre, oats weighing forty-two pounds to the bushel, whereas I believe the usual weight is thirty-two pounds to the bushel. We want to preserve the forests; and I shall join in the recommendation by Governor Folk when I return to Montana.

But we do protest and we do object to the employment of a forest reserve as a means for the regulation of the ranges of the West. In other words, we do object to the levying of tribute on the stockmen who graze their herds and their flocks, in order to secure revenue for the protection of the forest reserves. If the timber of the country belongs to all the People, then why should not all the People pay for the protection of the forests? Why levy tribute on Montana for forest protection, and then expect all the People to share equally in the proceeds? Is that fair?

We thank you, Mr Secretary, Gentlemen, for the work of reclamation that has been done in the West. Last year Mr Secretary Garfield opened one of the most important Government irrigation projects in Montana. We heartily thank the Department for the splendid work it is doing in that line. But when it comes to the ranges and the water power, we do say that while you have taken one-fifth of our area—which we willingly give, because we have plenty left—you should at least give us the income from the ranges and let us have the free and unconditional use of the water power in our own streams. [Applause]

The PRESIDING OFFICER (Governor DENEEN): President James, of the University of Illinois, has the floor.

ADDRESS BY DR EDMUND J. JAMES

PRESIDENT OF THE UNIVERSITY OF ILLINOIS

Mr Chairman and Gentlemen of the Conference:

The serious students of political economy throughout the country have been greatly pleased at the calling of this Conference and at the published announcement of its purposes and its program. Those of us who have been associated as teachers and professors of political economy in our schools and colleges for the last thirty years are especially pleased at the practical outcome of what may be called our theoretical efforts. The practical statesmen of the country, including the President of the United States, the Governors of the Commonwealths, and the heads of the great departments of administration in State and in Nation, are bringing here into the range of practical politics what we academic students have been urging in our lectures and our writings upon the attention of the American People for more than twenty years.

We organized some twenty-five years ago in the city of Saratoga what was known as The American Economic Association, made up primarily of the professors in political economy in American colleges and universities. The purpose of that association was the study of the principles underlying the economic exploitation of our national resources and the means by which the efficiency, industrial and commercial, of the American People, could be increased.

An outline of a program of the desirable development in the immediate future was prepared by a committee, of which I had the honor to be a member. It is a source of great satisfaction to those of us who were active in this initiatory work a generation ago, to find that the policy ~~there~~ outlined has become the policy not of one political party but of all political parties of the Nation.

The questions before this Conference are primarily, in our opinion, economic questions. They are not questions of geology or botany or mining in a narrow sense, but at bottom questions of economy; that is, questions of so organizing and utilizing our national resources as to produce in the large and in the long run the greatest return in the form of material wealth to the Nation.

No student of political economy can close his eyes to the fact that there have been very serious and short-sighted blunders made by our people in the mad rush for the most immediate exploitation of our natural resources and the most rapid piling up of our wealth. There is no doubt that we have in many directions wasted our patrimony; in our haste to get rich we have overreached ourselves and undermined the very basis on which a permanent national industry and a permanent national life must rest. It is high time to call a halt in this mad pursuit of gain, and the President of the United States and his intimate advisers, and especially Mr Gifford Pinchot, who perhaps has done more than any other one man to call the attention of the Nation to this riotous waste of our natural wealth, deserve the gratitude of us all, individually and collectively, and the gratitude of posterity, for calling attention in this effective way to this particular form of national folly.

Some of our economists, however, have called attention to one or two things which perhaps ought not to be lost sight of altogether, even in a Conference of this sort, which aims to fix public attention upon certain grave mistakes in our national policy.

There is no doubt that we have been extremely wasteful in our mining processes, taken as a whole, and it is high time we should direct public attention to the necessity of greater efficiency in our methods of mining than has characterized our operations thus far. But after all, the determination of what is the proper mining policy turns essentially upon economic considerations. Economic exploitation of our mining resources does not consist in making the utmost possible saving in the narrow sense of the term. It would, for instance, be perhaps entirely feasible in the mining of coal or iron to extract 90% or 95% of the coal or iron from the mines which are opened, and yet such a policy might be after all uneconomic. In other words, it would probably cost more than the entire coal is worth to extract from the mines 99% of the coal to be found in them. It would probably cost quite as much as the gold and silver and iron are worth to undertake to extract 99% of the metals to be found in the mines. That is to say, the extraction of all the valuable material would be such an expensive proceeding as to make mining itself unprofitable. This, of course, would be uneconomic in the highest degree. The question, therefore, as to what the best mining policy is must turn at bottom upon the fundamental question as to what method will, everything considered, turn out the highest possible value.

It would be quite feasible, therefore, though I should think there is very little probability of such a state of things, to adopt a set of mining laws which would hamper the development of the mining industry to an entirely unreasonable extent, as I am quite sure some of the mining codes of other countries have done.

There is no doubt that we have exploited our farms and our lands in many parts of the country in a very wasteful way; that we have exploited our soils in some cases to such an extent as almost to destroy them and to make it impossible to restore them except by a very large expenditure, if at all. Such a policy is certainly suicidal and the ignorance and carelessness which have marked our policy in regard to the forests certainly call for the highest condemnation. [Applause]

But economic students would insist that the fact that certain farms in the United States have passed out of cultivation does not of itself prove that the agricultural policy of the Nation has in the large been a mistaken one. Some of our expositions in the discussion of this question have seemed to imply that the ideal agricultural policy, from an economic point of view, would be to make every farm produce more the second year than it did the first and more the second decade than it did the first. Underlying common expositions on the subject of the wasting of the soil resources is the notion that the policy pursued by the People of the United States in their occupation and exploitation of the soil has been on the whole and in the large a short-sighted one. No one would deny of course that there are many illustrations of waste and criminal waste in the history of our soil development. But on the whole it is difficult to see how any other policy could have been outlined and made effective by Government interposition, which would have accomplished, on the whole, better results than those which have been actually achieved. Many farms in New England and New York and some parts of Pennsylvania and Virginia have in the last two generations fallen out of cultivation. This fact in itself does not necessarily prove that the agricultural policy of the State or Nation has been bad. On the contrary the fact that those unproductive farms fell out of cultivation was in many instances a sign of one of the greatest blessings that ever came to the American people, namely, the possession and opening up of magnificent opportunities in the Mississippi valley and the West. He would have been a foolish man to persist in cultivating the stony side of a New England hill which with the greatest effort would produce ten bushels of corn to the acre when with less than half the effort he could take up and cultivate soil which would produce fifty and a hundred bushels to the acre. If by any governmental policy we should have held in cultivation the farms of New England and northern New York and the hills of Pennsylvania and Virginia, it would probably be looked on today as one of the proofs of a short-sighted national policy. Such a policy would have doomed the American farmer during its continuance to poverty and to the simple life, if you please, of the poorer farms of New England during the 50's of the last century. Those farms fell out of cultivation not because they were exhausted, for in many instances they produced more than when they were first cultivated, nor because we can not cultivate them today as well as we could cultivate them when they were first put under the plow, if we were only willing to accept the return which they would bring us; but because the standard of life among the American people has advanced to a point where the methods of the cultivation of the 50's applied to those farms will not yield us that with which we are or should be content.

I believe it is true that owing to the impetus to agricultural investigation and agricultural improvement which was given by the opening up of the enormous agricultural resources of the Mississippi valley, such progress has been made in agriculture that we are rapidly nearing the point when we can again take these deserted farms into cultivation because by the application of our wider scientific knowledge we shall be able to make them yield a return more nearly in proportion to the labor expended upon them than they ever did in the palmiest days of their past history.

The same statement would apply to the poorer lands in nearly every part of the country. It is not in the national interest that they should be kept in cultivation simply for the sake of keeping them in cultivation when there are other lands which will make a larger return to national endeavor.

This fact, however, does not, of course, in the slightest degree, palliate or justify or alter the fact that in the exploitation of our soils as a whole we have not until very recently, and then only in certain portions of the country, begun to adopt as a general system that method of agriculture which science has demonstrated to be perfectly practical and which if pursued wisely and on a large scale will preserve forever the conditions of a sound and progressive agriculture.

So much for what the economists have urged and do urge today, and which view we pray shall not be overlooked.

I desire to call attention of this Conference to one other matter—one in which I think the President of the United States and his advisers and the Governors here present, and the people of the various States are all alike interested.

We all agree that we should preserve our natural resources in the sense that we should stop waste, or the mere sacrifice of national resources without adequate return. While I feel that it is almost impossible to exaggerate the loss which has come to the Nation from our ignorant and careless policies in regard to the forests and our streams, yet I think there has been just a little tendency, perhaps a natural tendency, among all of us, in realizing this waste and realizing the necessity of stopping it, to exaggerate some of the elements in the case. The statement, for instance, was made by one of our number yesterday and again today, that natural resources once used up are no longer available, and that there is no opportunity to increase our natural resources.

I desire to join issue on this latter point and very sharply. After all is said and done, the most striking illustrations of the wise development of natural resources and of the creation of a high civilization have been afforded by those peoples, which, without great natural resources, have developed great nations. The natural resources of the Dutch people were very small indeed. They were nearly entirely confined to sand and salt water, and yet they have developed one of the highest civilizations of the world, and their history demonstrates beyond a doubt that, after all, in the long run and in the large, brains count for more in the development of wealth and civilization than even natural wealth in the ordinary sense of that term.

It is possible for us by taking thought to increase our stature, at least in industrial development. It is possible by taking thought to change the face of nature and make the desert blossom like the rose; and for my part I should infinitely prefer a people which was somewhat wasteful, judged by ordinary standards, of the stored-up wealth in the earth but one which by the development of its own ability and its own powers undertook to heighten the value of these resources by the study of nature, to find out how to increase these resources, how to convert seemingly dead and useless matter into the most valuable of natural resources. I say such a people would have far greater chances of working out and maintaining a high civilization than a people which, without the use of its brains, simply depended upon the narrow-minded saving of the so-called natural wealth.

The magnificent work of our Department of Agriculture in the city of Washington has demonstrated that we can increase our natural resources. Whenever we naturalize a new crop and make possible a double or triple product from a given acre, we have increased our natural resources; and when by applying intelligence and a proper method of cultivation we make unnecessary, or if you please relatively unnecessary, the addition of fertilizers and the addition of more labor to produce a larger crop, we have certainly added to our natural resources in a very real sense. When we shall find how to obtain from common clay in almost illimitable amounts a useful metal like aluminum we are adding to our natural resources, and in my opinion we shall add far more to our natural resources by developing our ability to increase them than we can ever do by mere processes of saving; if those processes imply a limitation upon our production and upon the increase of our artificial wealth, if you please, that is upon the conversion of our natural wealth into the higher products of civilized life.

At the instigation of the Federal Government the Governments of the individual States have now created in every Commonwealth gr[illegible] experiment stations in the field of agriculture. The investigations made in these stations not only point the way by which we may save the waste in the exploitation of our fields, but also the way by which we may add to their productiveness without increasing in any way the amount of labor necessary to produce the crops. They will introduce new crops, more fruitful than the old. They will improve the plants themselves and thus add to our natural resources, perhaps in a degree out of all proportion to the waste which we have indulged in.

I desire to call attention to the fact that we may do just as much in the field of manufacturing, of engineering, of commerce, in the way of increasing in a true sense our natural resources as in that of agriculture. That perhaps is an idle dream of the chemist who imagines, as some of the German chemists do, that he is going to be able to turn clay into bread in his laboratory without its passing through any of the changes through which vegetation passes in its natural course. It may be an idle dream of the physicist that he shall ultimately yoke the sunlight and make it a means of lighting and driving our machinery, but certainly we have reached a point where we can see day after day new additions to our power, things which constitute a real addition to our natural resources—not a mere addition which comes from extra work or from the application of extra capital, but from the discovery of new facts about the things with which we stand face to face.

It is indeed a sin and a shame for us to waste the resources and the power locked up in our coal beds, our natural gas fields and our oil fields as we have been doing. That is to say when we throw away without any return whatever the enormous possibilities of wealth represented by these natural products, and anything which is necessary to enable us to stop this waste and make effective these elements of power should receive our hearty support. But for my part, Friends, I do not think that, if we exercise as we ought true economy in the utilization of these resources, we ought in any sense to stop their exploitation for fear that we shall exhaust them and leave our posterity without any means of heating or lighting or driving machinery. On the contrary, if we will spend money on the education of our people as we ought, calling their attention not merely to the desirability of preventing waste but to the infinitely greater desirability of developing every unit of intellectual and moral capacity to its utmost, we shall be traveling the road toward the largest development of national wealth and power.

So, speaking for the economic students of the country, I desire to ask this Conference and the Governors present here today, when they go home to their States, not merely to appoint forestry commissions and river improvement commissions, coal and oil commissions, and other agencies for the purpose of preventing the uneconomic exploitation and waste of our natural resources, great and important as these commissions will be; but to keep in mind this fact, that our greatest national, nay, our greatest natural resource, after all is said and done, is the brains of our people, and that money spent on the development of intellectual keenness and alertness will as surely bring in as large and even larger returns to the Nation as any means which may be devised for the purpose of preventing the immediate even though wasteful utilization of the raw products of nature.

In the development of these great experiment stations and in the development of the great schools of agriculture and engineering and commerce we have a means of adding to our natural resources even more rapidly than we have wasted them during the last century of our marvelous material progress. [Applause]

The PRESIDING OFFICER (Governor DENEEN): I have requested a Gentleman who has had much to do with every phase of all these questions to address you—the Secretary of the Interior, Mr Garfield.

ADDRESS BY HON. JAMES R. GARFIELD

SECRETARY OF THE INTERIOR

Mr Chairman and Gentlemen:

I have but very few words to say to you who have been discussing these questions which are of such direct and intimate interest to all the people of this country, and those words are in connection with the use and development and conservation of the public domain. Primarily, the purpose of the disposition of our public land has been to make homes for the People of this country, and we have not until recently felt the lack of land. We have not until recently felt the need of extending by means other than what nature gave us the area where men could settle, where homes could be built. But as has been expressed by numbers of you Gentlemen, it is clear that the time has come when we must consider how to conserve and preserve that which has been left to us; and in doing this the Nation, as well as the State, is primarily concerned. We act as a People together, not divided. The State lines mean much; but the State lines have been overlapped by the work of the men and women of this country. Trade itself has wiped out in many ways the State lines. The use of our natural resources and their preservation must necessarily wipe out for some purposes the State lines.

That does not for one moment mean that these great political sovereigns, the States, are losing anything of their inherent rights. It does not mean that the Federal Government, in the exercise of the powers given it under the Constitution, shall infringe upon the political or the industrial or the personal rights of those within these States; but it does mean that in the progress of our country we have found that the powers given the Federal Government must be used to develop those natural resources for the greatest good to the greatest number which do not lie simply within one State but extend into several States, and which, as in the case of water, must be considered as for the use of all the States within the given watershed rather than for the special States through which the water runs or in which the water rises. [Applause]

It has been suggested that in the forest reserves the plans which have been adopted by the Federal Government may not be along the right line. We do not for a moment maintain that the final word has been said, that the ideal law has been passed, or that the regulations adopted can not be improved. But let me ask this question in answer to the question put by the Governor of Montana—I believe something to this effect: "Why should the Federal Government charge for the general use of the Government those people who are using the forests; why should not that work be paid for by the Government as a whole rather than impose a charge upon those people who have used those special reserves?" I ask, as an answer to that question, Why should a great resource owned, as the Gentleman admits, by the People at large, be used by private interests, by somebody who is looking only to his own benefit, and not to the benefit of the People of the country? [Applause] The principle applies not only in the forest reserves, so far as grazing is concerned; it applies equally well to the use of the water powers of this country, [applause] in the conservation first, and afterward in the use of those water powers.

It is true the Federal Government within its jurisdiction, and the States within their jurisdictions, should control primarily the use and the disposition of those resources; but when the Federal Government has taken action, when the Federal Government has improved one of these great waterways, or has improved the headwaters of that waterway, or where a State has done the same—why, then, should not the Federal Government or the State impose upon the private interests using those waterways or those water powers for their private benefit, an imposition, a charge, a license? [Applause]

In other words, the question is simply this: The People as a whole own these natural resources as a whole; they are not divided. But the People as a whole own them, and it is for the People to determine whether those resources shall be used for the benefit of all, or shall be turned over to be used unregulated for the benefit of those who may perchance first get a foothold in any special locality. [Applause]

Now, again, that does not mean any taking away from the powers of the States. I, as a Buckeye, from Ohio, would object to any infringement or attempted infringement upon the powers of the people of the State of Ohio. But I recognize that in that State we have but little to say, so far as we, ourselves, are concerned, as to how the waters of Lake Erie and the waters of the Ohio river and the tributaries leading into the Ohio river shall be used for our purposes alone. I recognize that all those waters must be used as well for the benefit of our sister States, the States down the Mississippi watershed to the Gulf, and down the St. Lawrence watershed to the Atlantic ocean. [Applause]

We must recognize, as I said in the beginning, that trade and commerce have made this Nation one as it never was one before. Trade and commerce have tied our people together in such fashion that we can never be torn asunder by any mere discussion or theorizing on what the political powers and the political rights of the States may be. [Applause] We must recognize that the powers of the Government have grown as we as a People have grown. We must recognize that in the Constitution itself was the germ of political development, as in this great country of ours was the germ of our industrial development; and that it is not the increases of power from without, but the growth from within of the necessary powers of Government to conserve and regulate the use of the resources that are material in character.

And so, Mr President and Gentlemen, in the discussions of the subject I think we should approach from this point of view. We should, as so many of you have suggested, do this work by cooperation; and it is that which has brought together the Governors from the Commonwealths throughout the country.

We recognize that there are many questions concerning which there is an honest difference of opinion; but as I have listened to these addresses I have thought that the keynote of all is practically the same. It is simply a question how we can best work out the problem we all recognize.

If we misunderstand one another, and if it is the belief of the People of individual States that the Federal Government is attempting to overreach and come into their States for purposes not authorized by law, I do not blame them for objecting; but if by this Conference we are able to wipe away the misunderstanding, if we can show that there is no such purpose behind our movement, and that we can agree as to how best to divide this work, and where the line should be drawn, then we have accomplished a tremendous amount for the advance of the problem in which we are all interested.

The Governors of Idaho and Wyoming and Montana, who have spoken, will receive my aid, as Secretary of the Interior, in every possible way to develop under State laws all the resources of their States. I will be glad to join with them in aiding, under the Carey Act, or any other law, the development of every acre of arid land that their People will develop.

The People of the United States, through the Reclamation Service, have started as experimental farms several irrigation projects. We have shown the people of this country how the floods may be trained, how the waters may be stored, and how they may be applied to these semi-arid and arid regions; and we welcome every individual enterprise, every State enterprise, that has for its end the same purpose that the reclamation projects have for their end.

[Here the time bell rang, followed by cries of "Go on," "Go on"]

I do not want to take more than my share of the time. I thank you all very much.

[Cries of "Go on," "Go on"]

I will say one word further: that in the development of these private enterprises and in the development of the State enterprises, I believe it is the duty of this Government to see that when its powers are turned over to the States, those States shall be obliged to require that when individuals step in they shall recognize as a basis for any grant given them from the State through the Federal Government, that they must exercise those rights for the benefit of all, and not simply for their own private gain. [Applause]

And therefore, in regard to the Carey Act, it is my desire to find out how well the people who have taken advantage of that act have been improving their opportunities. I know that if the Governors of these States find with me that individual interests have attempted to misuse the rights granted that they will join with me in preventing further misuse and in restoring those lands, to the end that the men who wish to honestly develop them for home-making may be given preference over the men who wish merely to hold them for speculative advantage.

That leads to one other thought, in regard to the conservation of our fuel supply. There have been all sorts of estimates as to the number of years it will last. We don't know how long it will last; it is difficult to calculate. But in addition to the question of conservation—and when I say conservation I mean the highest possible development year by year to meet the needs of the communities where the fuel may lie—we must see to it that the law is not made so broad that it will be possible for individual interests to monopolize those great fuel supplies. [Applause] We have had examples of that. Therefore in any law that is passed, in any theory of disposition that is adopted, we must look not only to conservation and use, but we must look to the prevention of the monopolization of those fuels in the hands of a few favored interests.

Mr Ross (of Washington): I would like to ask Mr Garfield if he would consent to answer a question.

Secretary GARFIELD: I will be glad to do so if I can.

Mr Ross: Was it through the operation of State laws or through the operation of National laws that the great syndicates and monopolists acquired the interests over which they are exercising such immense control?

Secretary GARFIELD: That is rather a difficult question to answer briefly.

The PRESIDING OFFICER (Governor DENEEN): I assume that a question of that character could not be answered in a moment. It would probably take all the rest of the afternoon.

Mr Ross: I assume, from the position the conferees have taken, that the gentleman now speaking would probably be given a limited time for the purpose of answering questions.

Secretary GARFIELD: I think that is a question rather afield from the discussion here, and unless it be desired that I should give my individual opinion, I should prefer not to do so because I think that it injects into this discussion something that is quite foreign to the subject. [Applause]

The PRESIDING OFFICER: If that matter is of sufficient importance to occupy the attention of the Conference, time for the question may be allotted later; but it is manifest that we have not time to go into that now.

Governor Sheldon of Nebraska is recognized.

Governor SHELDON: Mr President, I do not wish at this time to offer any remarks of my own. Feeling, however, that the members of this Conference realize that the soil from which the products come to support our life is the greatest resource we have, I would like to ask you to hear, for a few minutes, the Director of the Nebraska Agricultural Experiment Station, Professor Burnett.

ADDRESS BY PROFESSOR E. A. BURNETT

DIRECTOR NEBRASKA AGRICULTURAL EXPERIMENT STATION

Mr President and Gentlemen:

I feel that it is indeed a most distinguished honor to be permitted to speak before this body on the subject of the conservation of our natural resources.

Coming from a western State where forest conditions do not largely prevail, and where there are no mines of coal and iron, the interest of our People has largely been turned toward the development of the resources of our fertile soil. In the Great Plains area the production of the soil is the paramount question.

We fully agree with the distinguished gentleman, Mr James J. Hill, that our methods are wasteful; and we have already begun to investigate, and in some measure to adopt more improved and scientific methods. Where once we were corn farmers or wheat farmers, we now grow crops in rotation. Where once we wasted the manure from our farms, we now apply it judiciously to the land. At least a considerable number of men are doing these things in a thoroughly scientific way, and are setting an example for others to follow.

This change in farm practice to new and better ways of doing has been influenced to a marked degree by the work of the United States Department of Agriculture, of which our honored Secretary James Wilson is the head, and by the work of the experiment stations. Since the establishment of the experiment stations, a new science of agriculture has developed and a vast fund of scientific information has been gathered, making it possible to use the soil, the plant, and the animal so as to secure the largest and most economical production and the greatest permanent good. In Nebraska we have substituted crop rotation for single-crop methods, and we have extended the growing of alfalfa, legumes, and grass, to restore the fertility of the land. We have greatly extended the area of winter wheat production, and are now driving the winter wheat region far northwestward by experiments to determine the limit of profitable production. We have introduced a new and early variety of oat, which ripens before the summer drought. We have shown the farmer how to produce double the average yield of corn now produced in the State. We have pushed the line of farm operations into the dry country, to find the limits of the areas where farming may be practiced with safety and the country built up in organized communities. I believe no work which the United States is doing today is bringing greater results than that expended in the Reclamation Service and in the effort of the Department of Agriculture to determine what crops and what methods will succeed in the semi-arid regions under "dry-farming" methods. The solution of these problems relates directly to the management or disposal of the public domain and the making habitable of uninhabited areas, and to the growth of prosperous commonwealths in regions now desolate and lawless.

The investment of money by the Federal Government and by the State Governments for purposes of agricultural investigation is a business proposition. The money invested last year is paying dividends this year, and the knowledge acquired by this investigation becomes a permanent asset to the community.

The great producing class which has gathered such bounteous harvests from the land must come to look upon the soil as an instrument of production rather than as a mine of wealth. Today, as never before, we appreciate that the virgin fertility of the land must not only be retained, but that tillage and crop production should make land more productive, and not more sterile. Not all the men who live on the land have yet come to this point of view. A few remain who still draw on the bank and trust Providence to keep the deposit good. Their practice leads to one inevitable result: sooner or later they will be driven from the land, because they do not understand the laws which govern its fertility.

After we have investigated all the facts which relate to the conservation of the soil, to the increase or decrease of its fertility, we must agree that for the sake of the public good we should have an educated man on every farm. Agricultural education is the only solution for the development and conservation of agricultural resources. It has doubled the production and much more than doubled the profit on individual farms. It has at the same time not only conserved but increased the natural fertility of the land. It has taught us to protect the timber on the watersheds and to plant timber on new lands. It has turned desert wastes into gardens and orchards. It has inspired the farmer with new ambition and a new motive for progress. It has changed the old social order and brought in a new and a better conception of rural life. Why, then, should not agricultural education be made universal in rural communities?

The Federal Government has done much to foster this education by the endowment of Land Grant Colleges and by direct appropriation. Many States have been liberal in their support of such education, and in those States and localities where such education has been most generously fostered there is today not only greater intelligence and care for our natural resources and our rural institutions, but there is a higher conception of the obligations of citizenship.

You can not enforce the laws which protect the mine and forest and stream without an intelligent conception of the general good which is to flow from such administration. You can not create the sentiment which will enact and execute wise laws relating to the planting and care of timber, to the restoration of our inland waterways, or to the maintenance of land, without a broad and liberal education of the common people regarding the benefits which will accrue from such an expenditure of public money.

The educated farmer is alive to all the questions which affect the great problem of rural progress. In the cultivation of the land he has yoked labor and science to multiply the fruits of toil. He enters into the life of the country and carries the burden of its social and political institutions. He is responsible for its progress and for its perpetuity. Educate the man who lives on the farm and the evils we have discussed relating to land and forest and stream will speedily be corrected. Neglect the cause of agricultural education, and legislation will be inefficient if not impossible.

I appeal to you, Governors and delegates from all parts of the Nation, as men of large influence, to foster in every possible way the cause of agricultural education in your States, in order that our farming lands may be built up, that our natural resources may be conserved, so that the generations of the future may not, because of our improvidence, find themselves deprived of their rightful inheritance. [Applause]

The **PRESIDING OFFICER** (Governor **DENEEN**): Mr W. S. Harvey of Philadelphia, who was called on yesterday by the President of the National Board of Trade, is recognized.

ADDRESS BY WILLIAM S. HARVEY

AMERICAN FORESTRY ASSOCIATION

Mr President:

I have been earnestly requested to say a few words in behalf of the National Board of Trade Committee on Forestry and Irrigation, of which I have the honor of being Chairman; and also to say a word on behalf of the State of Pennsylvania. I regret that our Governor is not present with us today, and I have no doubt you all regret that he is not here to speak for Pennsylvania at this hour. In his absence, with your permission, I will speak briefly for him.

I also want to say a few words on behalf of the American Forestry Association, of which the distinguished president is now upon your platform, Mr Secretary Wilson. I have had the honor of being associated with him for a number of years, as also with Mr Pinchot; and I have drawn my inspiration concerning the protection and intelligent use of our forests, and the protection of our waterways, from these two grand men. [Applause]

Before going further, I think I can reply to the question that a gentleman here asked the Secretary of the Interior. In a report of the Committee on Forestry and Irrigation of the National Board of Trade, made to Congress in January, 1906, a copy of which I have in my hand, we gave facts and information that we gathered from the General Land Office of the Department of the Interior. We were then earnestly advocating the repeal of the Timber and Stone Act, which authorized the purchase of land at $2.50 an acre, and we gathered the information from the General Land Office that, from 1901 to 1906, 5,000,000 acres of the most valuable timber land that belonged to the people of the United States, and was one of their greatest assets, had been sold to men for $2.50 an acre, or for less than $13,000,000, when the actual value of it was more than $100,000,000.

That is one of the laws that we have been trying to get repealed in Congress. It has been impossible for us to get it repealed or so amended that such a thing as that would not be possible.

In behalf of the State of Pennsylvania, I wish to say that Pennsylvania should have responded this morning immediately after the great Empire State of New York, when Mr Whipple, the Commissioner of that State, told us what they had done in having a million and a half acres in forest reservations and planting 1,100,000 trees this year. The State of Pennsylvania has acquired 900,000 acres, and they are planting this year 400,000 trees. We are reforesting with white pine; and in fifteen or twenty years the State of Pennsylvania will have a nice income from its forest reserves. Not only that, but Pennsylvania is setting an example that I sincerely trust the Governor of every State will follow for the benefit of suffering humanity wherever forest reserves can be created, and that is this: Dr Rothrock, one of the great pioneers in forest conservation, having demonstrated, as Dr Dudley and others present can testify, that the forests can be used for preserving and restoring health, especially of those who are afflicted with tuberculosis, the State of Pennsylvania this last year appropriated $600,000 for establishing sanitariums on the forest reserves to build up and restore the health and usefulness of thousands of people who are suffering from tubercular and other disorders. So much for dear old Pennsylvania. [Applause]

Now, on behalf of the National Board of Trade, I wish to read to you a copy of a dispatch I sent on May 5 to Speaker Cannon—a "cannon" that many of us wish could be spiked—in regard to the forestry question:

> Forest reserves of the South and East are vital for the preservation and perpetuation of our waterways, for transportation and production of cheap power, and essential to the extension of foreign trade if we are to maintain the American wage-level

in competition with other manufacturing nations. The Lever Bill, I believe, is consistent with the Constitutional requirements of the Judiciary Committee of the House, and satisfactory to the friends of waterways and forestry. Will you not exert your influence and power at this psychologic time that should be irresistible for such a wise and perpetually beneficent cause that is earnestly advocated by more than fifty million Americans whose patriotic gratitude success will command.

That is the text of a subject that might be talked over for an hour. I regret that Mr Gompers left the room. I was anxious for him to hear what I have to say. If we want to prolong American prosperity and maintain the high level of American wages, our wage being just double that of other nations of the world, we must protect our facilities and enlarge our ability to produce and manufacture the things that we manufacture at the lowest cost.

The development of water power in the Southern States alone is equal to the development of more than 3,000,000 horsepower, and there would be a saving in the cost of power for manufacturing purposes of not less than $15 per horsepower, or an average saving to the people in the Appalachian region alone of $45,000,000 each year. That means that we would have that advantage over those in other countries with whom we have to compete in marketing our goods. If we had no advantage in the marketing of our goods, either in excellence or quantity or in cheapness of production, it simply would mean that American labor would be reduced to the labor of all other nations of the world. If we want to maintain its high level we must protect the facilities that will enable us to produce our goods at the lowest possible cost.

Do you wonder, therefore, that I most earnestly advocate that we shall at this time so petition Congress that they will feel obliged to listen to the voice of the American People on behalf of the preservation and the conservation and the utilization of those great resources that will enable us to protect American labor? We want to protect American labor. Our opportunity will be gone if it is not immediately seized. [Applause]

The **PRESIDING OFFICER** (Governor **DENEEN**): Governor Burke has been called for, and is recognized

ADDRESS BY JOHN BURKE

GOVERNOR OF NORTH DAKOTA

Mr President and Gentlemen of the Conference:

Great fear has been expressed that in the conservation of our natural resources the Nation might encroach on the rights of the States, and yet there are some delegates who want to give to the States the control of the National Forests. In my judgment there is no necessity for any conflict between the State and the Nation, and there will be no conflict if we are careful to recognize the rights of each, and insist that each shall conserve and control the natural resources peculiarly its own.

No one asks of the Federal Government anything that it has not a Constitutional right to give. The Government can improve its own property. It can set aside as national forest reserves timber growing upon Government land. If it does so, such forest reserves should be controlled and regulated by the Federal Government. So long as they are, there is no chance for a conflict between the State and Nation. Should Congress give the State authority to regulate and control national forests, then there would at once arise many opportunities for conflict. The State would not undertake to reforest the portions from which timber had been cut, and would in many instances use the same only for the benefit of those living in the present, and the object for which the forest is set aside would wholly fail. The Federal Government should retain absolute control over such territory, so as to prevent such conflict, to insure the reforesting of the portions from which timber has been cut, and to conserve the whole in the interests of those who are to come after us as well as those who are now enjoying its benefits.

The same is true of the mines and other natural resources on Government land. The interstate commerce clause in the Constitution gives to Congress absolute control of all interstate commerce on navigable waters of the United States, and while the title to the adjacent land and to the land beneath the water vests in the riparian owners, the water is for the use of the People, and is under and subject to the exclusive control of Congress. [Applause]

The laws of our land require us as individuals to use our property, or property in our possession, in such a way as not to interfere with the property of others; and the Congress of the United States, having exclusive control over our navigable rivers, should, in the name of commerce, control them in such a way as not to injure the property of the People.

Every cent of money invested in our natural resources is adding so much to the national wealth. It will be used in purchasing American material; it will be paid out to American laborers; it will go into circulation in American cities; and prosperity will follow in its wake, and leave us richer in national wealth. [Applause]

The Presiding Officer (Governor Deneen): Mr Jones of Texas will speak for a moment for the Governor of Texas, who is unavoidably absent.

ADDRESS BY W. GOODRICH JONES

Mr President and Gentlemen:

In the unavoidable absence of our Governor, who regrets very much that he is unable to attend this Conference, and as one of his advisors, I beg to bring you from Texas a message of cordial greeting and esteem, and of hearty cooperation in this great work.

Texas is a great State and has a bright future, but we recognize that her future welfare can be advanced and maintained only with your cooperation and assistance.

Even as Atlas of old upheld the world, so does Texas, at the base of this great Nation, uphold on her mighty shoulders the greatest aggregation of free and enlightened citizens the world has ever beheld. With one arm in the Gulf of Mexico, and one arm encircling the Rockies, she feels her responsibility not only to uphold, but to clothe and feed the entire population of this great Union, if occasion demand. [Applause] She has the territory, the soil, and the climate; but what she needs is water—water falling as rain, water flowing in from the rivers through irrigating ditches. Our rainfall and our river-flow we believe is connected with the forests. We want our forests, and your forests, whether owned by corporations or by the Government, reserved for our children's children by scientific cutting, forest extension, and reforesting. We want to see checked the present method of wholesale cutting, waste, and fire-swept sterility. We want our farming lands saved from erosion, our rivers deepened and made navigable and saved from the destructive floods rolling down from the hillsides. We want our harbors deepened so as to admit the largest vessels, and we wish kept back so far as possible on the rich uplands the millions of tons of rich soil that are now swept down yearly through the rivers into our harbors, and that block entrance to our ports.

We promise to join with you most heartily and earnestly in whatever future work this Conference may outline. We are in sympathy with you in your Appalachain-White Mountain Forest Reserve, the great contemplated waterway from Lake Michigan to the Gulf, the drainage of the Everglades of Florida, and the conserving of the river sources in the great western forest reserves.

Texas claims a citizenship of the brightest, bravest, and truest men, drawn thither from North, East, and West. Our soil, our climate, our natural resources, and our productiveness are unparalleled in any country today of equal territory and under one flag. In no other section of the world will you find such crops of cotton, corn, oats, wheat, rice, sugar, tobacco, semi-tropical and tropical fruits and vegetables, fish and oysters, sheep, swine, cattle, lumber, oil, coal, and all mineral wealth.

These little flowers, the "Cape Jessamine" grown at Alvin near the Gulf, and presented to this Conference with the compliments of our State, carry in their white and fragrant petals the token of our esteem.

In the hour of necessity, when Galveston lay wrecked and bleeding from a great hurricane and tidal wave, Gentlemen, from your every State came substantial tokens of brotherly love and assistance. We of Texas have never forgotten the hands extended to us in our hour of dire distress; and we stand ready to cooperate with you in any movement for the good of the Nation. [Applause]

On motion of Governor Noel, at 5:25 p. m., the Conference rose.

FIFTH SESSION

The Fifth Session of the Conference was called to order at 10 oclock a. m. on May 15, 1908, in the East Room of the White House, by the President of the United States.

Governor **BLANCHARD**: On behalf of the Committee on Resolutions I have a report to make, and with your permission, Mr President, I will make it from the platform.

The **PRESIDENT**: Kindly step to the platform, Governor.

Governor **BLANCHARD**: Mr. President, inasmuch as I am the organ of a Committee of this Conference I trust the bell—the bell calling time on speakers—invisible to the sense of sight, but manifesting itself always to the sense of hearing, will be held in reserve while I present the report of the Committee, and while I am giving the reasons of the Committee for their action.

The **PRESIDENT**: If not held in reserve you may disregard it.

Governor **BLANCHARD**: Mr President, and Gentlemen of the Conference, on behalf of your Committee on Resolutions I beg to present the following declaration of views and recommendations:

DECLARATION

We, the Governors of the States and Territories of the United States of America, in Conference assembled, do hereby declare the conviction that the great prosperity of our country rests upon the abundant resources of the land chosen by our forefathers for their homes and where they laid the foundation of this great Nation.

We look upon these resources as a heritage to be made use of in establishing and promoting the comfort, prosperity, and happiness of the American People, but not to be wasted, deteriorated, or needlessly destroyed.

We agree that our country's future is involved in this; that the great natural resources supply the material basis on which our civilization must continue to depend, and on which the perpetuity of the Nation itself rests.

We agree, in the light of facts brought to our knowledge and from information received from sources which we can not doubt, that this material basis is threatened with exhaustion. Even as each succeeding generation from the birth of the Nation has performed its part in promoting the progress and development of the Republic, so do we in this generation recognize it as *a high duty to perform our part; and this duty in large degree lies in the adoption of measures for the conservation of the natural wealth of the country.* [Applause]

We declare our firm conviction that this conservation of our natural resources is a subject of transcendent importance, which should engage unremittingly the attention of the Nation, the States, and the People in earnest cooperation. These natural resources include the land on which we live and which yields our food; the living waters which fertilize the soil, supply power, and form great avenues of commerce; the forests which yield the materials for our homes, prevent erosion of the soil, and conserve the navigation and other uses of our streams; and the minerals which form the basis of our industrial life, and supply us with heat, light, and power.

We agree that the land should be so used that erosion and soil-wash shall cease; that there should be reclamation of arid and semi-arid regions by means of irrigation, and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the People; that the forests which regulate our rivers, support our industries, and promote the fertility and productiveness of the soil should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness, and habitability of our country should be preserved and increased; that the sources of national wealth exist for the benefit of the People, and that monopoly thereof should not be tolerated. [Applause]

We commend the wise forethought of the President in sounding the note of warning as to the waste and exhaustion of the natural resources of the country, and signify our high appreciation of his action in calling this Conference to consider the same and to seek remedies therefor through cooperation of the Nation and the States. [Applause]

We agree that this cooperation should find expression in suitable action by the Congress within the limits of and coextensive with the national jurisdiction of the subject, and, complementary thereto, by the legislatures of the several States within the limits of and coextensive with their jurisdiction.

We declare the conviction that in the use of the natural resources our independent States are interdependent and bound together by ties of mutual benefits, responsibilities and duties. [Applause]

We agree in the wisdom of future conferences between the President, Members of Congress, and the Governors of States on the conservation of our natural resources with a view of continued cooperation and action on the lines suggested; and to this end we advise that from time to time, as in his judgment may seem wise, the President call the Governors of the States and Members of Congress and others into conference.

We agree that further action is advisable to ascertain the present condition of our natural resources and to promote the conservation of the same; and to that end we recommend the appointment by each State of a Commission on the Conservation of Natural Resources, to cooperate with each other and with any similar commission of the Federal Government. [Great applause]

We urge the continuation and extension of forest policies adapted to secure the husbanding and renewal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the maintenance of the purity and navigability of our streams. We recognize that the private ownership of forest lands entails responsibilities in the interests of all the People, and we favor the enactment of laws looking to the protection and replacement of privately owned forests. [Applause]

We recognize in our waters a most valuable asset of the People of the United States, and we recommend the enactment of laws looking to the conservation of water resources for irrigation, water supply, power, and navigation, to the end that navigable and source streams may be brought under complete control and fully utilized for every purpose. We especially urge on the Federal Congress the immediate adoption of a wise, active, and thorough waterway policy, providing for the prompt improvement of our streams and the conservation of their watersheds required for the uses of commerce and the protection of the interests of our People. [Applause]

We recommend the enactment of laws looking to the prevention of waste in the mining and extraction of coal, oil, gas, and other minerals with a view to their wise conservation for the use of the People, and to the protection of human life in the mines. [Applause]

Let us conserve the foundations of our prosperity. [Great applause]

Respectfully submitted,

NEWTON C. BLANCHARD, *Louisiana, Chairman*
JOHN F. FORT, *New Jersey*
J. O. DAVIDSON, *Wisconsin*
JOHN C. CUTLER, *Utah*
M. F. ANSEL, *South Carolina*

Attest:

W J MCGEE, *Secretary Inland Waterways Commission,*
Recording Secretary of the Conference

STATEMENT BY GOVERNOR BLANCHARD

Mr President, it has been observed, doubtless, that the paper submitted by the Committee on Resolutions, as the result of its labors, is general in character, as broad, liberal, and catholic as it was possible to make it, and of a scope purely national.

It has been noted, I trust, that the Committee has not embodied in its report a discussion or recommendation of any specific project of the many pressed upon its notice. Under the order of the Conference that any member thereof might hand in to the Committee any resolution which he might desire considered, a number of resolutions were submitted covering specific projects, all bearing, more or less, upon the great subject which we were called together to consider.

But the Committee, in preparing its report, has kept constantly before it the one great idea that the President in calling the Conference had but one purpose—to take thought for the conservation of the natural resources of our country. [Applause] It has sought to limit the declarations propounded to this idea, this one purpose.

The Committee recognizes, as every one must, that the natural resources of the country may be grouped under four great heads—land, waters, forests, and minerals—and to these alone, in their broadest sense, looking to their conservation, prolongation, and perpetuation, it confined itself.

We were impressed with the wisdom of the call for this Conference. We believe that all must recognize that it is a good thing for the Governors of the States to meet, from time to time, with the President of the United States and such others as he should see fit to include in the invitation, to consider great questions affecting our country—its welfare, its life maybe, its progress, prosperity, happiness—upon which questions the cooperative action of the Nation, the States, and the People is advisable and desired.

The present Conference, on the great subject it met to consider, is believed to be one of the most important ever held in our country. [Applause.]

The Committee believed that the precedent set should be followed, and the Declaration submitted invites the President—the present one or any future President—to do so. [Applause]

Personally, I have long thought that, if the Governors of the States could themselves from time to time get together, exchanging ideas and views touching the governmental and other affairs of their States, much good would come out of it. Such meetings could be had by the Governors of their own motion, and some kind of an organization, looking to this, it might be well to initiate before the Governors who are in Washington now leave the Capital.

But the Committee on Resolutions has thought it wise to omit any mention of meetings to be originated and held by the Governors themselves, and this omission is based on the conviction that when a Conference on National matters is desirable it is the President of the United States who should take the initiative, and from him the invitations to the Conference should emanate. [Applause]

The report of the Committee takes care to emphasize the distinct jurisdiction of the States, pointing out that the States, in dealing with the great question of the conservation of the natural wealth of the Republic, are doing so along lines of proper State jurisdiction of the subject, in cooperation with the Federal Government acting within the limits of the National jurisdiction thereof.

There can be no doubt, Gentlemen of the Conference, and all must admit it, that in order to the proper conservation and protection of the natural resources of the country there is exercise alike for the broad jurisdiction of the Nation and the less broad, though independent, jurisdiction of the States.

What is wanted is harmony and concert of action by all—the Nation, the State, the People—to the common end of the preservation of those things so essential to the welfare of all. [Applause]

In that spirit, and in that alone, your Committee has prepared the Declaration with its recommendations as submitted. [Applause]

On behalf of the Committee, Mr President, I move the adoption of the report. [Applause]

The motion was seconded by several voices.

The **President**: It is moved and seconded that the Declaration submitted be adopted. The motion should have careful consideration.

Governor **Glenn**: Mr President, this is a very important paper, and some of us would like very much to think over some of the provisions in it, some of the suggestions. I would like it if that motion might not be acted on until the evening session, so that we might have an opportunity to think a little more about it. Not with the view of criticism but merely in the way of suggestion, I desire to call attention to that part of the report of the Committee in regard to the President calling together the Governors of the different States to consider National matters. If we would always have a President of such broad mind and comprehensive view as yourself, there would be no objection to that. But, Sir, while we are Governors of States, all of us love this Nation as much as the President, and there might come a time when the President might not be disposed to act, and when the majority of the Governors of the various States might think they ought to be gotten together.

Do you not think that on the application of a third or half of the Governors of the States the President might be required, under this report, to call us together? I throw these remarks out, so that we can think over the matter with cool judgment and be prepared, when we come here this afternoon, to act on the report.

I am not prepared to say to you that I object to the report in its present form, but I simply throw out the thought of what might occur if this discretion were put into the hands of a President who might not be a broad-minded man.

I can not speak for the rest of the Governors, but I can only say that for myself I wish this great meeting had occurred at the beginning of my administration and not at its close. It has been a benediction to me, and made me love my Nation ten times as much, if that were possible. [Applause]

The **President**: As a mere suggestion, simply that the Conference may have something before it, Governor Glenn, suppose you submit an amendment, something in the nature of saying that the President shall call the Governors together in his discretion, and whenever requested to do so by one-third of the Governors.

Governor **Glenn**: I make that as a motion, as an amendment to the resolution or motion before the Conference.

Governor **Blanchard**: Mr President, I, like my friend from North Carolina, am winding up my term as Governor of Louisiana. With us in Louisiana it is a term of four years and out—

Governor **Glenn**: That is my fix.

Governor **Blanchard**: There being a constitutional inhibition against a second consecutive term. [Laughter] So that I am not likely to be much in evidence in succeeding Conferences of Governors.

But the Governor never dies, Mr President. My friend from North Carolina and myself step out, but other men, equally competent and equally patriotic, step in. It is with us like it was in one-time monarchial France; "Le Roi est mort; vive le Roi." And whether I am to be a member or not, I want to see an occasional Conference held between the President of the United States and the Governors.

An objection to the amendment proposed by the Governor of North Carolina, which occurs to me, is this: He suggests that the Governors be called in Conference with the President whenever one-third of the Governors request it. But suppose the President does not want to meet the Governors in Conference? [Laughter] Suppose the President should be of the view that, just then, there was no occasion for a Conference. Are you going to force one upon him?

If the amendment submitted by the Governor of North Carolina be adopted, one-third of the Governors might get together and "resolve," as did the tailors in Tooley Street in London some centuries ago. But what if the President responded that he saw no occasion for a Conference between himself and the Governors; that there was no great national question to consider? [Laughter] I would suggest that my friend from North Carolina leave the matter as the Committee has written it. This very question was fully discussed and considered by your Committee. [Applause]

Governor **Glenn**: Mr President, if you noticed, in the beginning of my remarks, I simply asked that this matter go over so that we might have an opportunity to think of these things, as the Committee has had ample opportunity to think of them. It comes to us, you see, at first blush, as a new proposition.

Now, Mr President, no man has any higher admiration and respect for the President of the United States than I have; and while sometimes his policy and my policy do not agree, he is my President, as well as the President of the Republican Party. [Applause] And, Sir, I have always been ready, and still am ready, as you know, Mr President, to uphold your hand in every laudable effort and aspiration for the benefit of the United States of America. But suppose a third of the Governors of this great Nation, acting in concert with the other Governors of this Nation, thought it necessary for the best good of this great country of ours to have a meeting, and should petition the President of the United States to call that meeting; and that he, forsooth, should refuse to do so, for some arbitrary or some small motive. Then, Sir, the Governors would feel, having done him the honor of requesting a conference, that they could request Governors to meet, independent of the President, for the purpose of taking joint action. I do think there ought to be some way by which we could be brought together for the purpose of consulting, not only for the benefit of single States, but for the common good of this great Nation; some means by which we can get together, whether the President of the United States should say "yes" or "no."

Governor Noel: I think a solution, and an easy one, can be reached. This was a Committee first appointed under the suggestion not only of the Governors but of all attending this Conference. It is true it was composed of Governors, but this whole Declaration of principles and action is national in its scope. After our Session yesterday afternoon there was a meeting called of Governors, and a committee of three appointed, with a view of action on their part when they wanted to meet. They have authority to meet with the insurance commissioners, agricultural commissioners, and others, which needs no authority from the President for them to come together. They have held a separate meeting, and have appointed a committee, and that committee can suggest some method for the Governors to meet at their own volition, and suggest such places and times as they want. It would not conflict with this Declaration, and this Declaration need not, therefore, be marred by any amendment or action of any sort. I favor both. I favor the Declaration of principles and action as submitted in full. I do not want to meet with anybody that does not want to meet with me. [Laughter] If the President does not want to meet with us he need not call us, and if we call he need not come. This same is true as to all the others. It is purely voluntary, and we do not want him to call us unless he wants to do so himself; and if we want to meet without him we can meet. The Governors have that power and privilege; they have their committee, and it can be so arranged. Therefore I do not see the least occasion to make an amendment to anything in this Declaration of principles, and I favor the adoption just as submitted; and I also favor the adoption of a resolution or declaration along the line suggested by Governor Glenn when it is offered by the Committee, of which I believe he is a member, and also Governor Folk.

Governor DAVIDSON: Mr President, your Committee took exactly that view of the situation which has just been stated by Governor Noel. We wanted to leave the proposition free for the President to call a Conference whenever he thought it necessary. There is nothing in that Declaration that prevents the Governors from calling a Conference of their own if they so desire. We wanted to leave the President's hands free to call a Conference whenever he thought it was necessary to have the Governors of the different States meet with him, he consulting with them and they consulting with him on any and all questions; and we also wanted to leave it absolutely free for the Governors themselves, if they saw fit, to correspond with each other and have a Conference of their own any time they desire.

It seems to me that the Declaration as presented in regard to that question is absolutely free, and I think it ought to be adopted without amendment. [Applause]

Governor FOLK: Mr President, Discussions like this are more or less embarrassing. There is no one here who has a higher regard for the President than I have. There is no one here who feels under a deeper sense of personal obligation to the present occupant of the Presidential chair than I do; but by this Declaration offered by the Committee we are conferring, not upon the individual who happens to occupy the Chair now, but upon that Office, a power and authority to call the Governors of the States together at any time that he may see fit. The distinguished personage before us can not always be President of the United States [laughter]; and suppose that some time in the future there should be a man in that Office who would want to use such power or prestige as might be obtained from a gathering of the Governors to coerce Congress, for instance, into adopting some law. [Laughter and applause] Now, while we all think that the Big Stick once in a while is a mighty good thing, [great applause] I do not know what man hereafter may have that instrument in his hand. [Laughter] So I for one am unwilling to commit, not myself but the man who may follow me as Governor of Missouri, to what may possibly be used merely as an instrument to accomplish something with another branch of the Government. Now, precedents are dangerous things. At the moment they may seem unimportant, and just now this Declaration may not seem of much consequence; but some time in the future it may rise up and haunt us.

We want to preserve the natural resources of this country, and we agree with you, Mr President, that we also want to preserve the moral health of this country. We believe with you that there can be no material prosperity unless accompanied by moral prosperity. The Governors of the States working along their lines will always be ready to cooperate with the President of the United States working along his line; but I believe in maintaining the ideas of Government as they were laid out by the Fathers of the Republic—that is, let us always remain an indestructible union of self-governing States. I do not believe in establishing any precedent, however unimportant it may seem at the time, which step by step may eventually destroy that independence.

Now, I favor the amendment offered by the Governor of North Carolina—

Governor Noel: Do you not understand this contemplates merely an invitation, and if you did not choose to accept it next time—

Governor Folk: Governor, you are from Mississippi?

Governor Noel: Yes.

Governor Folk: You know the rules of Southern hospitality?

Governor Noel: Yes.

Governor Folk: When you are invited to a place is it the part of the guest to suggest to the host that you be invited again? [Laughter]

Governor Noel: No; but I can express my joy at coming. [Laughter and applause]

Governor Folk: You can express that as we have done.

Governor Noel: Permit me to ask another question: Was not the purpose of this meeting two-fold—one purpose being that we might get information and inspiration, and the other that through our closer and more intimate knowledge of State and local conditions we might express those State conditions to the Senators and Representatives who are here, a long way from home, and to the extent of our expression of the needs and views and interests that we would exercise moral suasion on our Senators and Representatives? I thought that was one of the purposes of the Conference. [Laughter and applause]

Governor Folk: I simply want to say, Mr President, that this Conference has been of great value to me, and I believe to every man in it. I believe it will have an influence for good that will be lasting. It has given me information that I could not have obtained otherwise; and as I said yesterday, as soon as I return to Missouri I intend to appoint a State Forestry Commission to take up the subjects that have been discussed here, and I hope other Governors will do the same. [Applause] It has been of much benefit to me and to all; and I am sure that we would all be glad to come back again. It is simply a question of principle that I was discussing. That is all.

Governor Glenn: With the permission of the Gentlemen I will withdraw my motion. It has been suggested to me by the Governor of Kentucky, who, since I have been here I have come to conclude has a very level head on him, that we never have had, and probably never will have, a little man in the Presidency. Therefore I withdraw the amendment. [Great applause]

The **President**: I will say, Governor Glenn, I can not imagine that there ever would be a President who, if asked by a third of the Governors, would at all hesitate to call a Conference. I should assume that as a matter of course. I think the only thing that would make a President hesitate about calling such a Conference would be a lack of knowledge as to whether the Governors wished to come; and the minute he was assured that as many as a third of them desired the Conference, I do not believe there would be any question but that he would call it.

Gentlemen, is there further debate?

[Cries of "Question," "Question"]

The question was taken viva voce, and Governor Blanchard's motion was agreed to without dissenting voice.

The **President**: Before calling for the regular business, let me say one word in appreciation of the high plane of thought and action on which the Governors have carried on this Conference. I believe the Conference has done good. I believe that it will do very much good; and the reason is to be found in the spirit in which you Gentlemen have approached your task. [Applause] You have set before yourselves clearly the ideal of simple performance of duty to the People of the States and of the Nation. And I think you can go to your homes feeling that as a reward for the drain upon your time, for the trouble you have taken, you have the knowledge that you have worked efficiently for the furtherance of the popular good; and I thank you heartily for what you have done. [Great applause]

I now ask that Mr Bryan speak to the Conference. [Great applause]

ADDRESS BY HON. WILLIAM JENNINGS BRYAN

Mr President, Governors, and Gentlemen of the Conference:

I hesitate to speak at all, because the Governors who are assembled here represent constituencies, and those constituencies, well marked, are looking to them for the protection of State interests in conjunction with the development of National interests, and I recognize that a private citizen like myself with no fixed constituency [laughter and applause] speaks, if he speaks at all, either for himself or for a nebulous portion of the Nation. I recognize that such an one speaks only for himself and therefore with less authority; and I have been anxious that those who were in official position should discuss these questions and leave us unofficial visitors to the last.

Then I recognize, too, that it is impossible in the short time that one can properly occupy to take up and elaborate any of these themes; therefore, in the time that it is permitted me to speak, I am going to present in writing certain observations which I think apply to the entire subject; and I will ask the pardon of this assembly for reading, for I assure you that reading is no more objectionable to you than it is to me. [Laughter]

I acknowledge my obligation to President Roosevelt for the opportunity which he has given me to participate in this meeting. The Conference marks the beginning of a new era, during which increasing attention will be given to the far-reaching problems involved in the conservation of the Nation's resources. [Applause] The epoch-making speech with which the chief executive opened the First Session must exert a powerful influence upon the country at large, as it has upon those who were fortunate enough to hear him.

The assembling of the Governors of nearly all the forty-six States is in itself an historic event of the first magnitude, for this meeting, and the future meetings which this one assures, will facilitate cooperation between the States, make easier the doing of those things which should be done by the national Government, and stimulate the several States to act more speedily and with better information upon the things which should be done by the States independently. There has been some difference of opinion as to the relative spheres of the Nation and the State, but such discussions as we have had here will help to define these spheres and to harmonize conflicting opinions.

I am a strict constructionist, if that means to believe that the Federal Government is one of delegated powers and that constitutional limitations should be carefully observed. I am jealous of any encroachment upon the rights of the State, believing that the States are as indestructible as the Union is indissoluble. It is, however, entirely consistent with this theory to believe, as I do believe, that it is just as imperative that the general Government shall discharge the duties delegated to it, as it is that the States shall exercise the powers reserved to them. *There is no twilight zone between the Nation and the State, in which exploiting interests can take refuge from both,* [great applause] and my observation is that most—not all, but most—of the contentions over the line between Nation and State are traceable to predatory corporations which are trying to shield themselves from deserved punishment, or endeavoring to prevent needed restraining legislation. The first point which I desire to make is that earnest men, with an unselfish purpose and concerned only for the public good, will be able to agree upon legislation which will not only preserve for the future the inheritance which we have received from a bountiful Providence, but preserve it in such a way as to avoid the dangers of centralization. Nothing that is necessary is impossible; and it would be a reflection upon the intelligence, as well as upon the patriotism of our people, to doubt the value of gatherings of this kind.

The time alloted to each speaker is so short that instead of attempting to discuss the various questions presented I shall content myself with a few suggestions in line with the very able papers that have been presented by the specialists who have appeared before us. I begin with the proposition that it should be our purpose not only to preserve the Nation's resources for future generations by reducing waste to a minimum, but that we should see to it that a few of the people do not monopolize that which is in equity the property of all the People. [Applause] The earth belongs to each generation, and it is as criminal to fetter future generations with perpetual franchises, making the multitude servants to a favored faction of the population, as it would be to unnecessarily impair the common store. [Applause] I am glad that Secretary Garfield emphasized this point. It is one that must always be kept in mind by the Nation and by the several States.

The first national asset is to be found in the life of the People, and Mr Mitchell very properly and with great force pointed out the importance of safeguarding the life, the limbs, and the health of those who are engaged in converting the Nation's natural resources into material wealth. I would go a step farther and say that we could well afford to include in the appropriations made by Congress a sum sufficient to carry on necessary investigations into the causes of diseases national in their scope, and to stimulate the search for remedies which would add to the life, health, and usefulness of the whole population. [Applause]

I was surprised at the statistics given in regard to our coal and our iron ore. While it is possible that new coal measures and new ore beds may be discovered, we can not afford to base our conduct upon speculations as to what may yet be discovered. We should begin an intelligent supervision and conservation of that which is known to exist, and I respectfully submit that it is worth while to ask ourselves whether we can afford to offer a bounty to those who are engaged in exhausting the supply of raw materials, which, when gone, can not be replaced. Surely if there is any importation which we can properly encourage by a free list, it is the importation of those raw materials of which our own supply is limited. [Applause] And what I say in regard to coal and iron ore is equally applicable to timber. It is hardly consistent to discourage the importation of lumber while we worry about the devastation of our forests.

Mr Hill has rendered the Conference a real service in presenting the facts and statistics set forth in his address on land and its cultivation.

Few of us, probably, were conscious of the impairment of the crop value of our soil. I am sure that a clear understanding of this subject will lead to a still further enlargement of the work of the Department of Agriculture, and to still closer cooperation between the Department of Agriculture and the States in teaching economical methods of agriculture. [Applause] Already the rapid growth of the agricultural college offers encouragement, and I am glad to express my appreciation of the valuable work done by Secretary Wilson and his associates in bringing to our country fruits, plants, and grasses suited to the different parts of our country. As the farmer pays more than his share of the taxes and receives less than his share of the direct benefits which flow from national appropriations, it is only justice to him that we shall be liberal in the support of every effort put forth for the improvement of agriculture. [Applause]

Irrigation has justified the arguments which led to the inauguration of the work. No one who has witnessed the transformation of the desert into field and garden can doubt the wisdom of the steps that have been taken. Here, as elsewhere, both the Nation and the State can find a field for legitimate activity; and I am sure that there will be a continuation of this work until all of the waters which can be utilized for that purpose have been appropriated.

And I will add here that last September I visited the southern part of Idaho and saw there a tract that has recently been reclaimed under the operation of the Carey law. I had been there ten years before. I had looked upon these lands so barren that it seemed as if it were impossible they could ever be made useful. When I went back this time and found that in three years 170,000 acres of land had been reclaimed; that where three years ago nothing but the sage brush grew they are now raising seven tons of alfalfa to the acre, and more than a hundred bushels of oats; when I found that ten thousand people are living on that tract; that in one town that has grown up in that time there are 1,910 inhabitants, and that in the three banks they had deposits of over $500,000,—I had some realization of the magic power of water when applied to these desert lands. [Applause]

The same principle which was invoked in support of irrigation can be invoked in support of drainage. The question is not whether the water shall be brought on the land or taken off the land; it is whether the land shall be made tillable and its wealth-producing qualities utilized. Drainage of the swamps is, therefore, as legitimate a work as the reclamation of arid wastes.

No subject has been brought out more prominently at this Conference than the subject of forestry, and it justifies the time devoted to it; for our timber lands touch our national interests at several points. Our use of lumber is enormous, but immense as would be the inconvenience and loss caused by the absence of lumber, the consequence of the destruction of our forests would be still more disastrous to the Nation. As has been shown, the timber on our mountain ranges protects our water supply. Not to speak of changes in climate which might follow the denuding of our mountains, the loss to the irrigated country could not be remedied, and the damage to the streams could not be calculated. And if this is not enough to arouse the interest of all, I may add that the destruction of the forests on the mountain ranges would in time impair the underflow upon which we rely for our well water.

The good effects of this Conference are already apparent in the determination expressed by several Governors to at once appoint Forestry Commissions and begin such work as the States can do. [Applause] In this case action is so urgent and the field to be covered so large that both the Nation and the several States can exercise themselves to the full without danger of doing too much. [Applause] The national reservations already made in the West, and the new reservations that ought to be made, and are likely to be made, in the White Mountains and in the Appalachian Range, can doubtless be so administered as to protect national interests without unduly burdening the States in which the reservations are located, or needlessly interfering with the development of the States. No national policy need retard the development of the Western States, and their own interests would restrain them from sacrificing future wealth and protection for temporary advantage.

Lastly, I come to our interior waterways. I shall not defend the improvement of these waterways on the ground that such improvement would help to regulate railroad rates (although it would aid regulation), for whenever the people are ready they will exercise the power which they have to regulate by legislation. But water traffic is less expensive than traffic by rail, and there are many commodities which can be transported much more cheaply by water than they possibly could be carried on land. I believe it has been estimated that an expenditure of $500,000,000 on interior waterways would result in a saving of nearly $200,000,000 annually.

If this saving were equally divided between the producers and the consumers it would be an enormous profit to both; and Mr Carnegie has pointed out that water transportation, by requiring less iron and less coal in proportion to the freight carried, would enable us to postpone the exhaustion of our iron mines and our coal beds.

The development of water transportation is essentially a national project because the water-courses run by and through many States. And yet, as has been pointed out, it would be possible for the States to do a certain amount of developing along this line if they were permitted to avail themselves of the use of the water-power that could be developed.

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Just a word in conclusion about an investment in permanent improvements. Money spent in care for the life and health of the People, in protecting the soil from erosion and from exhaustion, in preventing waste in the use of minerals of limited supply, in the reclamation of deserts and of swamps, in the preservation of forests still remaining, and in the replanting of denuded tracts—money invested in these and in the development of waterways and in the deepening of harbors is an investment yielding an annual return. If any of these expenditures fail to bring a return at once the money expended is like a bequest to those who come after it. And, as the parent lives for his children as well as for himself, so the citizen provides for the future as well as for the present.

This gathering will be remembered by future generations, because they as well as ourselves will be the recipients of the benefits which will flow from this Conference. We have all been strengthened by communion together; our vision has been enlarged, and the enthusiasm here aroused will permeate every State and every community. [Great applause]

The PRESIDENT: Before proceeding with the business, I will ask that Judge Goudy, President of the National Irrigation Congress, be permitted to extend an invitation.

Judge GOUDY: Mr President and Gentlemen of the Conference: As the President of the National Irrigation Congress, I take pleasure in extending to you, and each of you, a most cordial invitation to be present at the Sixteenth Session of this Congress, to be held at Albuquerque, New Mexico, September 29 to October 3 next. This association, Gentlemen, if you will bear with me for a moment, has been engaged for a number of years in discussing and deliberating on the matters that you have been discussing and considering here—especially the preservation of the forests, because we realize more than anyone else that without the forests being preserved and conserved at the headwaters of the streams, irrigation is bound to cease or to be greatly retarded. Some one has said that we are wild and wooly in the West. I desire to assure you that we take Puck and Judge, and read Harper's and Leslie's weeklies and other great civilized documents, and that in Colorado at least we are no longer in a state of civil war. We are quiet and peaceful, and those of you who have not been out West, if you will come out there next fall, will realize for the first time in your lives that you are outdoors. [Applause] You will also see examples of what is not only possible but practicable in reclamation by means of irrigation. In New Mexico and in Colorado alone millions of dollars have been expended by private enterprise in reclaiming vast tracts of rich lands.

I am reminded that the regular program is to be taken up, and I want to add but one word. In those two States we have reclaimed more than two million acres by private enterprise. I want you to look at the forest reservations in the southern part of Colorado on the headwaters of the Rio Grande, and I want to say that, although some of the Governors of the different States differ from Gifford Pinchot in his policy, after personal observation and experience in that reservation we fully endorse the policy and the practice of Gifford Pinchot and his Forest Service. [Great applause]

The **President**: It has been suggested that as this is especially a meeting of the Governors of the States, the Conference would particularly like to hear from any and all Governors who have not yet spoken; [applause] and if any Governor will speak to us we will be very glad to hear him.

I am glad to recognize Governor Comer.

ADDRESS BY BRAXTON BRAGG COMER

GOVERNOR OF ALABAMA

Mr President and Governors:

I announce myself first because Alabama stands first in the alphabetic list of States.

I have not spoken before because Alabama combines all the great resources under discussion, and I wished to make a talk embracing the State's interest in all of these resources. In mineral, iron and coal, Alabama stands among the first. To give you some idea of the importance of our iron and coal production; both at times are largely exported, iron being sent to England, Belgium, and Spain. In the Birmingham district iron is being converted into basic steel rails on a very large scale, the Birmingham basic steel rail being classed higher than the Bessemer steel rail. So acute has the competition for Alabama iron and steel become that the United States Steel Company, that greatest of corporations, stronger almost than the Government itself, during the late financial depression thought it a good and profitable time to buy our largest iron and steel industry, the Tennessee Coal and Iron Company, and they are now carrying it among their best assets. In this purchase they own something like 300,000 acres of land. Under the law, they can shut down operations or fully develop their holdings as they see proper or most advantageous; and I can not understand how by State or Federal statute you can limit the output, whether great or small. In fact in Alabama we believe, instead of the supply of coal and iron ore in the mineral district being limited to a few decades, that like the supply in Wyoming it will last for hundreds of years, and the people of my State are more anxious for development than otherwise.

Forestry has been discussed. For some reason Alabama has not been mentioned by any one, either as regards our great supply of coal and iron lands, or our immense tracts of timbered lands, or our very high position when it comes to navigable streams. Commencing in the Carolinas the pine trees start (and by the way, Governor Glenn, your State gets its name, "Tar Heel State," from the fact that it is covered with great bodies of pine timber; back one hundred years ago this timber was used for the purpose of making tar, and you are often called "Tar Heels") as a belt of yellow pine timber which sweeps on through Georgia, Alabama, Florida, Mississippi, and even Texas, constituting the great yellow pine belt of the United States. No timber or lumber stands higher or better, and east of the Mississippi none is in more common use. How to preserve what is left, and in due justice to the owners of these lands and to the future weal of the State, and the people thereof, prevent its utter destruction, is one of the most serious problems before us today. We have been anxiously waiting to find out what you Governors are going to suggest and do about it. The only thing I have heard recommended to you, or by you, is that part of President Roosevelt's address in which he states that the Supreme Court has sustained the laws of Maine and New Jersey looking to the preservation of this great property of the Nation.

In Alabama we have a forestry law, and the execution of it is in the hands of our Game Commission. The authority of the Commission extends to every county in the State, and while the law has been in existence only about twelve months we have already convicted a man for carelessly setting fire to timber. Our law is dependent on the cooperation of the owners of the timber, and the State is doing its best to encourage this cooperation so that the cutting of the timber will be after some defined plan that will secure its continued growth and prevent the complete destruction of the forest.

As stated above, the only suggestion so far made has been that a State can, by statute, limit the use of the timber to sizes above a certain diameter. While this might interfere with the plans of some of the owners, yet in the end it will be unquestionably the best thing for the owners and the State. I do not know that I, as Governor of Alabama, could recommend such a law, and I do not know that even if I should recommend it the Legislature would enact it. I have heard you, yourself, Mr President, say that Governors could witness, and you could witness that all laws recommended by a President or Governor were not adopted by Congress or Legislatures; and if you of the "Big Stick" can not manage Congress, how much harder would it be for a Governor to direct a Legislature. [Laughter]

To show how fast timber is growing in our section, we have mills that cut 100,000, 150,000, even 200,000 feet per day. This is 1,000,000 feet per week. If a law was made and observed limiting the cutting of timber to ten inches, we would have continuously growing trees larger than you could plant, and instead of the timber property of the State being in constant danger of total destruction, we would have it continually growing and everlasting. If this could be done, then this meeting would not be in vain. I will simply add that the timber of Alabama, being cut just as it is, will probably last only about twenty or twenty-five years. What will come after that, we do not know. There are quite a few trees being put out by our corporations, and one of our railroads is leading the way, planting many catalpas.

Discussion of irrigation in Alabama is needless, because the evaporation from the Gulf of Mexico on our southern border is caught up in the clouds and blown by our southern breezes through our State, and at timely intervals waters and fructifies the whole land.

Mr President, I was a member of the Rivers and Harbors Congress which met at Willard Hotel some time ago, and I heard Governor Johnson of Minnesota discuss the waterways of the States. In his speech he mentioned the rivers of the States beyond the Ohio, but did not get down as far as Alabama. Now, Governor Johnson did not know that Alabama has a river, did you, Governor? And yet from what I can hear from my State down there, which holds a primary next Monday, you would like to stop awhile in our State and know a great deal more about it; in fact, I do not know of a State in which you have more interest right now, and I wish to suggest to you, both for the present and future, that you study our resources and become better acquainted with us. There is my friend, Hon. W. J. Bryan. I must treat you both exactly alike today, regardless of how much favoritism may be shown next Monday.

When Mr Bryan alluded to the mineral resources of the United States, he forgot that Alabama was on the map; forgot that Alabama had coal and iron, notwithstanding he had been to Birmingham more than once, and he did not know that the Alabama Birmingham stands second only to that great English Birmingham, when it comes to what can and will be done. In waterways, Alabama stands second only to Louisiana in the sisterhood of States. With the exception of Louisiana, we have more waterways and less channel than any other State in the Union. I say we have the waterway; what we want is the channel. [Laughter]

Mr President, in our State we concede that the Federal Government has the easement in all of our streams when it comes to navigation rights. When it comes to ownership of the water, or the power to be developed in our waterways, like Governor Folk, of Missouri, I am a little bit skittish and am inclined to back out.

Outside of the navigation easement, we believe in the riparian owner. Whatever there is in the power of these waterways belongs to us, and if the Federal Government proposes to take hold of this power and sell or rent the franchise, we believe it will be dangerous to tinker with the sacred rights of State sovereignty.

Our waterways commence with the Tennessee. This river connects with the great Mississippi river system, and this system, no matter from what section you are, creates a factor of the most far-reaching importance, unequaled in the United States, perhaps, or in the world. This system, extending from the Great Lakes, stretching out like arteries all the way down to the Gulf of Mexico, and thence across to other lands that are touched by water carriage, is an inheritance we should preserve forever. It is the chief artery of the nation, and for Alabama, we thank God we connect with it, and we trust the time will come when as State and Nation we will make the most of it, and with whatever can be done to develop and utilize it Alabama is in hearty accord.

Tennessee river runs right through our State, and we want the channel of the Tennessee deepened and opened up, and the power particularly taken care of. When we speak of our waterways, we have at Florence and Tuscumbia the famous Muscle Shoals, and there is now being developed 188,000 horsepower there, second only to Niagara—a tremendous proposition. And yet we have fifty well-defined powers in all, not counting our streams. Governor Noel, of Mississippi, has only one waterway, the great Mississippi; but when you come to our State we have many, and I will say to Governor Noel that while we have the Tennessee, we have also the Mississippi. Besides these we have the Chattahoochee running along the side of our State to the Gulf at Apalachicola, giving power and navigation. We have the Coosa connecting with the Alabama, and the Tallapoosa, running from the center of the State, with much undeveloped power.

On the western edge of the State we have the Tombigbee flowing down to the Gulf, and crossing the middle section of the State we have the Warrior, both great waterways, both for power and for navigation. As Colonel Bryan suggested just now, we want to use these rivers for transportation, and we also want to use them for power. The Federal Government might and should go into developing the navigation of these waters, because in that they have an easement; but when it comes to an intimation that the Federal Government owns the power of these waters, then we are scared. We understand how the Federal Government can rent out vast areas of its own lands to ranchmen on which to graze their cattle, but when you come to renting a river, the riparian rights you do not control, we are a bit afraid. Yet we are in hearty accord with the whole system of improving our waterways for navigable purposes, and I have no doubt that every Governor will agree with me that this should be done. To repeat, we have the waterways; what we want is the channel.

Some time since I was traveling with a gentleman in Georgia, and we were discussing the waterfalls of Georgia. We spoke of Tallulah and the beautiful Bridal Veil falls, and spoke of falls in other States. My companion remarked very dryly that we had a great many waterfalls, but only Niagara had the water. [Laughter] In developing these waterways for navigation and for power, let the Federal Government do its share, and let each individual State do its share, and not mix up rights. I am willing to go along this way. Unlike Governor Blanchard, of Louisiana, my time as Governor is not yet out, having nearly three years to serve, and I will have plenty of time to take this great question before the people and discuss it with them. I want to state here that when we preserve our water and make it useful we preserve the strongest factor in taking care of the transportation of the State, and thereby secure reasonable charges from our public corporations.

Speaking of our national resources, I wish to endorse what Mr Hill said. I understand that out West they swear by Jim Hill. Will call your attention to the fact that in his speech he stated that 36% of our population were farmers, and that every business of the United States had its foundation on the work done by that 36% of our population. In other words, every business of the United States rests on the agricultural industries. Think of it, Mr President, think of it! I have heard you say many times that you wanted to give the under dog a chance, and so do we.

I will call your attention to the fact that it is the agricultural crop of the South—cotton—that is keeping up the gold reserve and balance of trade, and in a large measure has been the foundation rock of Wall Street in its wild speculations. It is what it bases its hope and trust on, in order to recoup its great transactions. Take all the speeches we have listened to here, commencing with the President's address, coming down through all of them and embracing that of Mr Hill, and they all allude to the fact that we have to depend upon the farmers just as we go back to the headwaters of our rivers to preserve conditions there, to make the water safe. So we have to go back to the foundation of all business—agriculture—and take care to protect the farmers if we would be safe in State and Nation. So, coupled with the care of our natural resources must be the care of the farmers. We say in common parlance that every business rests on him. The farmers make the crops; the farmers make the railroads; the farmers make the merchants; the farmers make the banks; the farmers make Wall Street. This is all true, and we know it is; and every one of us, State and Nation, should join in taking care of the farmer and his interest.

I have heard of the Fourteenth Amendment being used to prevent confiscation of property without due process of law. Mr President, for God's sake do not let them use the Fourteenth Amendment and by due process of law oppress and confiscate these people who are the force and power of the nation. [Applause]

The **President**: We are greatly indebted to Governor Comer for his speech protesting against centralization. Governor, I do not understand that you object to the National Government appropriating money to clear out the Muscle Shoals? [Laughter and applause]

Seriously, I want to say one word about what has been called the "twilight land" between the powers of the Federal Government and the State Governments. My primary aim, in the legislation that I have advocated for the regulation of the great corporations, has been to provide some effective popular sovereign for each corporation. [Applause] What I am trying to avoid is finding out, not negatively but by decisions, first that the State can not act, and then a few years later, by another decision, that the Nation can not act either; and I am trying to find out where one or the other *can* act, so that there shall always be *some* sovereign power that, on behalf of the People, can hold every corporation, every individual, to an accountability, and so that its or his acts shall be beneficial to all the People as a whole. [Applause and cheers] In matters that relate only to the People within a State, of course the State is to be sovereign, and it should have the power to act. If the matter is such that the State itself can not act, then I wish, on behalf of the State, that the National Government should act. [Applause] Take such a matter as charging rent for water power. My position has been simply that where a privilege, which may be of untold value in the future to the private individuals granted it, is asked from the Federal Government, that the Federal Government shall put on the grant a condition that it shall not be a grant in perpetuity. [Applause] Make the term long enough so that the corporation shall have an ample material reward. The corporation deserves it. Give an ample reward to the captain of industry, but not an indeterminate reward. [Applause] Put in a provision that will enable our children at the end of a certain specified period to say what in their judgment should be done with that great natural value which is of use to the grantee only because the People as a whole allow him to use it. It is eminently right that he should be allowed to make ample profit from his development of it, but make him pay something for the privilege, and make the grant for a fixed period, so that when the conditions change, as in all probability they will change, our children—the Nation of the future—shall have the right to determine the conditions under which that privilege shall then be enjoyed. [Applause] Where that policy can be best carried out by the States, carry it out by the States; where it can be best carried out by the Nation, carry it out by the Nation. My concern is not with the academic side of the question. My concern is in the employment either of the principle of State rights or the principle of National sovereignty as will best conserve the needs of the People as a whole. [Great applause and cheers]

Governor Mead of Washington is recognized.

ADDRESS BY A. E. MEAD

GOVERNOR OF WASHINGTON

Mr President and Gentlemen:

I certainly am glad to accept the invitation of the President to speak a few words in behalf of the Pacific Coast, realizing that I have the honor to represent that matchless portion of the Union since my fellow-Governors of the States of California and Oregon are not with us. The Chief Executive of California is engaged in the very pleasing occupation of assisting in extending a welcome to the great fleet that was dispatched to the Pacific by the President as Commander-in-Chief of the Army and Navy. [Applause] And I am very anxious, Mr President, to return to the State of Washington and be in at the finish. [Applause]

I can assure you, Gentlemen, that it is a great pleasure to come from the extreme northwestern corner of this great Republic and join in this important Conference. It is an honor and a privilege indeed to represent the magnificent State of Washington in such a Conference, recognizing that a bountiful Providence permits us at this time to furnish one-eighth of the lumber to this country and more than 50% of the shingles used in the homes of our People. And in connection with the lumbering industry, it is a pleasure to me to say to the President and to the members of this Conference that in my three and one-half years of experience as the Chief Executive of that State, I have received material assistance from the lumbermen of the Commonwealth in providing ways and means for the conservation and the preservation of our forests. [Applause]

A few years ago we provided a commission for the purpose of preventing forest fires, a law that ought to have been enacted possibly 25 years ago. The conservation of resources is a policy that now has the support of public sentiment, and whether it is forest preservation, whether it is reforestation, whether it is the prevention of fires, I know that our people will be glad to cooperate with our sister States and with the Government of the United States in strengthening the laws and the policies along that line, independent of any question of States rights or centralization. [Applause] We are interested along the line of forest preservation for the benefit of the industries depending on timber supply and for the benefit of irrigation; and we are also interested in the conservation of other resources, including one that has not heretofore been touched upon here—an industry I assume that is very dear to the heart of the President, and that is the conservation of our fishing industry. [Applause]

The PRESIDENT: Good!

Governor MEAD. When you examine the salmon fishing industry of this world you will find that it is confined to the Territory of Alaska, which is represented here by Governor Hoggatt—a Territory, by the way, we are very proud of—[applause] the acquisition of which was brought about by that great statesman, William H. Seward, while acting as Secretary of State during the administration of President Johnson, together with the Province of British Columbia and the States of Washington and Oregon; a very limited area of this earth's surface relatively, and yet from that area the salmon pack of the world is drawn. We are interested in conserving and perpetuating that industry, an industry second to none in our State. We are glad indeed to cooperate with the Government along that line. It is an educational proposition. We need the benefit of scientific research in order to accomplish quick results. Our people are able and willing to contribute from their revenues and from their means for the conservation of all these interests. My friends, with that disposition, with an exalted patriotism among the people in favor of the perpetuation of these God-given resources, I, for one, have no fear for the future of this great Republic and of its People.

Governors, I am proud indeed of the opportunity to speak just for a moment as a representative of the great Pacific Coast. I am heartily in sympathy with every word and sentiment of the Declaration that has been submitted to this Conference, by the Committee, and has been adopted. I am glad indeed to stand for a few moments before you, representing as I do the State of Washington, a State whose people feel that when those who rocked the cradle of that great Commonwealth decided to place across the map the name of the immortal Washington, they by that act reared a monument to the memory of the first Chief Executive of this country higher than the exalted column in this city, greater than any column made by man, a monument that will forever stand imperishable. [Applause]

The PRESIDENT: Governor Hanly is recognized. Will Governor Hanly kindly take the platform?

ADDRESS BY J. FRANK HANLY

GOVERNOR OF INDIANA

Mr President and Governors:

I have hesitated to speak in this Conference. I came to learn and not to teach. The President in calling this Conference planted a mile-stone in American History. [Applause] He offered us as the representatives of the States of the Union an unparalleled opportunity; and in the Declaration we have just adopted, Mr President, I submit we have risen to that opportunity. [Applause]

I am in profound sympathy with the purposes of this Conference. I have been glad to hear the papers by the distinguished gentlemen who have special knowledge of the several questions about which they have written. But there are yet some things in connection with these questions that for my own benefit and the benefit of my People I should like yet to hear discussed. In suggesting the question that I now suggest I do not voice antagonism; I only give expression to my spirit of inquiry, my desire for information.

I can well understand how there may be conservation of the soil and its productiveness; I can understand how there may be improvement of the great waterways. I should like to know, however, how there can be substantial conservation of the coal deposits of the country. Is it to come from limitation of production? We are now producing only what is necessary to meet the commercial and industrial demands of the Nation. If we put a limitation upon the production of this natural resource, do we not put a limitation upon the industrial development of the Nation? Who shall say where the production shall cease, except the demand that is made by the industrial necessity of the Nation? If we limit the output of coal or of iron, do we not invite at once the very condition we have been seeking to avoid, the immediate importation of these natural products from other lands? This is true of forestry, too. How are you going to place a limitation upon the right of the citizen who owns a forest tract to convert it into useful products? I have not read the decisions referred to by the President, and I am not raising these objections now as representing my own view; they are submitted as interrogation points touching matters on which I should like to carry away more definite information. The right of ownership in property, the individual right of ownership, has value only as the owner may use it. I should like, too, to know more about the proposition of national reservations in the Appalachian mountains and elsewhere. I should like this information from men in authority, men who have given these questions close study and who may speak with benefit to those who hear. What I mean, Gentlemen, is this: The People do not now realize the necessity for the conservation of these resources of ours, nor do they understand how it is to be done; and the school established must be a kindergarten school. And as a student in that school I should like to hear more on these questions; I should like answer to the questions that I have raised in these few remarks. If you will give me the information in concrete form that I may carry back to my People and give to them, you will do more in behalf of the cause we have at heart than any amount of oratory can possibly do. [Applause]

I thank you, Gentlemen, and say in conclusion that I am in full sympathy with the purposes of this Conference. [Applause]

The **President**: Governor Willson is recognized.

ADDRESS BY AUGUSTUS E. WILLSON

GOVERNOR OF KENTUCKY

Mr President and Gentlemen of the Conference:

Kentucky has perhaps a greater interest in waterways [laughter] than any other State in the Union in proportion to its territory; [laughter] and let me deprecate the thought that may have come to some of my brothers that I am going to speak as a special authority on the subject of irrigation. [Laughter] We have, however, nearly 40,000 square miles of territory, 1,500 miles of river, and a great deal more of Governor Comer's Tennessee river than he has in Alabama; we have the Cumberland of Kentucky, the Licking, the Big Sandy, and one of vast political significance, Salt river. [Laughter]

I merely wish to bring to the attention of the Conference a matter that seems to me useful. The oratorical product of Kentucky ended some years ago, and we are now studying the strictly utilitarian phases of life. We have in Kentucky many important coal companies. One of those has been managed in a manner that, I think, in its business management and in its own foresight presents a lesson of usefulness to every State. It was mentioned here that in the production of coal it cost about seven lives for every million of tons. This company, in ten years, has produced 1,100,000 tons, with only one life lost. [Applause] This company bought great areas of land. A State Commissioner of a great State mentioned that they had planted a million young trees; this one company has alone planted on its land one million walnut trees and about a quarter of a million locust, catalpa, and poplar or tulip trees in the past few years.

[Applause] This information is from a paper, which I shall submit, by Mr John B. Atkinson, one of my associates and advisors here, and a very useful one, who perhaps gave me the only good thought that Kentucky could bring here; and I shall submit his paper to the Secretary for incorporation into the record. This company that I refer to is to continue planting trees in a systematic and earnest way, and it seemed to me that this was possibly a useful suggestion that could be carried home from here with benefit to all of us.

I wish to say one word of our Conference, as friends together. There is not a man here that has not felt from his very heart the appreciation of that broad-minded public spirit which prompted the invitation, and which every man here appreciates with deep sincerity and earnestness. [Applause] There is not a man here, either Governor or advisor, who will not go away from here a good deal better man than he came. [Applause and cries of "Good"] No, not one of them.

In our affairs of life, part is regulated by Constitution and law, but much the greater part by reason and moral influence. Once or twice we have been in danger of taking our power here, our legal power, too seriously. This Conference has not a shred of legal power as a body, whatever some individual members may have of legal power. As a Conference this Conference rests on the power of reason and moral suasion. [Applause] It has no legal authority, and yet it may be in its final result and in its constant usefulness from year to year quite as valuable as a body based on constitutional or statutory power.

I speak of the good this meeting has done us. Coming from Kentucky and reading about other Governors, I had an impression of one of our brothers as a man impatient of ordinary considerations, and came here to share the feeling that every one of you has of him as of a big-hearted real American whom we are all glad to know, and all glad to be with; our brother from North Carolina [applause]; and I thank him [Governor Glenn] for bringing to this assembly the thought that came to my mind some years ago at a meeting of the Army of the Cumberland, where it fell to my good fortune, when I was only a "tin soldier" in that conference with good soldiers, to respond to the toast to the President, soon after our President took his seat; and it seemed to me one of the truest things that had ever come to me was that while we praised the virtue of loyalty, and all mankind from earliest history has praised the virtue of loyalty—even in monarchies, where the ruler comes not by choice of the People, poets and orators have praised loyalty to them—yet if there was ever a people on earth that ought to be loyal to the one Administration after another as they succeed year after year, it ought to be these United States of America. [Great applause] For in all the line of Presidents from George Washington till now, we have never had a man that has not been an American Gentleman, entitled to the loyal support, the affection and help, of all of his People. [Applause] And it is easy to be a loyal American, loyal not only to the spirit of our country, to the spirit of brotherhood and neighborhood friendship, but loyal to the constituted authorities of the Nation and of every State. We have a right to be that. [Applause]

I thank you very earnestly. I thank you for your patient hearing, and I am very glad to have this opportunity. I wish to say just one word as a member of the committee that was appointed last night. After the session of yesterday afternoon we asked that the Governors should stay after the meeting. It was the outgrowth of the feeling all of us had that it was such a good thing to be together—a feeling that was uppermost in the heart of every man here. Only a small number stayed, and a committee was appointed looking to future meetings. Of course it will be desirable to have as many future meetings in Washington as possible. Perhaps the accepting of State hospitality would let down this standard and let down the interest. I should be very glad if after this meeting the Governors would stay and talk about this matter. It would be greatly to our advantage to have an invitation from the President, but it might be possible, and all of us might get great use from an association of the Governors, not at all legal or constitutional or statutory, but merely an association of the Governors so that we can get to know each other. There are many matters in which a new Governor at least, like myself, feels he needs counsel and help about from other Governors—matters of extradition, matters of general public policy, matters to decide what one should do in certain emergencies that come to all of us. I have four years ahead of me, and I feel that I needed this Conference; and I feel glad that I am here, and am glad that I have had the opportunity of meeting the Governors. I thank you sincerely. [Great applause]

The **President**: Gentlemen are looking toward Governor Hoch. Will Governor Hoch take the platform?

Address by Edward W. Hoch

GOVERNOR OF KANSAS

Mr President and Gentlemen of the Conference:

I shall detain you but a moment. A native myself of Kentucky, I share with the Governor of that great Commonwealth, who has just left the platform, his interest in waterways; and my interest in waterways, and also in the ways of water, is intensified because I happen to preside over a prohibition State. [Applause]

Like my brother, Governor Hanly of Indiana, I have taken small part in the deliberations of this great Conference, because I have preferred to be enriched by the wisdom of the experts, wisely selected by our President to discuss these great problems, rather than to impoverish you by consuming your time. I can appropriate the sentiment of the great McKinley, who said on a great occasion, "I have no knowledge not common to my countrymen." I am not an expert on any of these specific problems we have been here discussing, but I have an abiding interest in the great country in which we live, and I have an especial interest in and some little knowledge of the People of the great State I have the honor of representing on this floor.

Kansas is not primarily interested in any of these specific problems, and yet we are indirectly and mightily interested in all of them. We have no denuded forests to restore, but we need lumber, and we want our national forests preserved and restored. We have no great navigable rivers to improve, but we are immensely interested in the transportation problem, because no similar number of people perhaps are greater shippers. But our indirect interest in all the things discussed here only emphasizes the mutuality of interest of all the States in each other.

The thing that I shall carry away from here more than any other one thing is the universality of our common interests in this country. I shall carry with me these documents, the papers read here, rich in information; and I pause to say that in my judgment the printing department of this nation has never sent out a more valuable document than will be enclosed between the two covers of the great book which will contain the proceedings of this Conference. But while I shall carry these valuable things in my arms I shall carry a more valuable thing home with me in my heart, the thought of the mutuality of our common interests.

If you will glance at the map there on the wall you will observe, with reference to the State of Kansas, that if a line be drawn north and south and east and west across that map those lines will intersect in the very heart of Kansas. Kansas is neither northern nor southern, neither eastern nor western. It is the great central State, the hub of the Union, if you please. [Laughter and applause] As I have elsewhere expressed it, it is the rich, juicy meat in the national sandwich. [Laughter] But let me repeat that the great fact which stands out in this Conference like a promontory, is the fact of the mutuality of interests between the States. There is in the best of all books, with the contents of which, of course, the distinguished Presiding Officer here and all the Governors are familiar, a beautiful simile which I wish to appropriate to adorn my thought. It is said in the Bible that the hands can not say to the feet, We have no need of thee, and the eyes can not say to the ears, We have no need of thee, nor can any one member of the body say to another, I have no need of thee. And so, borrowing this beautiful figure, I say to you—and I shall carry that impression home with me more perhaps than any other one—no one State can say to another, We have no need of thee. California can not say to Florida, We have no need of thee, and Maine can not say to Texas, We have no need of thee. Kansas can not say to any other State, We have no need of thee. We are mutually interested; and this great Conference has cemented this Union, I think, as no other combination has ever done before. [Great applause]

Gentlemen, it was worth coming fifteen hundred miles to see the two distinguished representatives of the two great parties in this country (Mr Roosevelt and Mr Bryan) meet upon a common platform and shake hands over the expression of a common principle. [Great applause] How true it is that as American citizens, regardless of party, we have more in concord than we have in conflict. [Applause] I shall be glad to carry this spirit of mutuality, of fraternity, home with me; and I believe I voice the sentiment of every one who hears me when I say we shall go to our homes more profoundly realizing than ever before that we have indeed one country, no North, no South, no East, no West, but one glorious land of the free. [Great applause]

The **President**: Governor Sheldon is recognized.

Address by George L. Sheldon

GOVERNOR OF NEBRASKA

Mr President, and Gentlemen of the Conference:

I do not expect to add anything at this time to the words of wisdom that we have been listening to for the last three days. I simply wish to express the appreciation of the People of my State that the People of this country have at last become aroused to the necessity of conserving those national resources of the country which in the past, to the shame of the States and the Nation, they have permitted to be wastefully exploited, for the benefit of the few in many instances, instead of for the benefit of the whole People. [Applause]

So far as Nebraska is concerned, she has been carrying on in her own way whatever could be done to prevent these things. We burned cow chips out there for years and saved coal. We are now building bridges and other structures of concrete for the benefit of Carnegie and his iron companies.

But after all, this question, it seems to me, is an educational one. The purpose of this Conference, in some degree, has been accomplished if it has aroused the People of this country to the necessity of so developing and preserving their resources that future generations may have the benefit that is due them. [Applause] I would like to see the States of this Nation assist the United States Government more than they have in the past. I want to say that in my opinion there is no work of the National Government that is bringing greater benefit to the People of this Nation as a whole than the agricultural work that is being done by the Agricultural Department, and by the numerous agricultural experiment stations. [Applause]

Let me give one illustration: In Lancaster county, Nebraska, the average yield of corn for the last five years, I have been informed, has been 35 bushels to the acre. Yet the corn raised under the direction of the agricultural experiment station located in that county for the last five years, under the same conditions and the same circumstances, has been 76 bushels to the acre. [Applause]

The People of Nebraska will do whatever they can to help themselves and to help the People of the country solve this great question. All realize, as do you, that it will not be settled here, but that it will be settled at the fireside of the American homes. The American People are a busy people, but when their attention is directed to a question that vitally affects them, and they study it and think it over in their homes, they will solve it; and their answer will be the right and proper one. [Applause]

Much has been said of forestry, and I concur and agree with what has been said in that line. I wish, however, to call attention to the work that Nebraska has been doing for years in persuading people to plant trees; and I must refer, in this connection, to the distinguished services of a distinguished son of Nebraska, the Honorable J. Sterling Morton. [Applause]

I regret exceedingly, Mr. President, that I could not be present at the dinner and the opening of this Conference. I was not present because I felt obliged to carry the greetings of my State to the Navy of our Nation when it arrived on our western coast. And as I came across the Continent to be present at this Conference, I saw a sight in California that presents a good object lesson. I may, perhaps, be pardoned for taking the time to give you the picture briefly.

We left the Pacific Coast last Saturday, and that evening crossed the Sierra Nevada Mountains. In the valley of the Sacramento we saw palm and orange trees. The hillsides were planted with fruit trees. All kinds of vegetation was growing luxuriantly. Flowers were in bloom.

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We wended our way up the valley of American river. A steady stream of water was flowing. It was an abundant, steady flow, and we saw where it had given life to the valley, which otherwise would have been barren. When we reached the summit one could see the cause and the reason of the ceaseless flow. On the top of those beautiful peaks, clad with fir and spruce, the snow was held in the clefts of the rocks under the shade of the trees. The slow melting of the snow made the water flow ever onward and onward in an even volume, that the most use might be made of it for the benefit of vegetable life. This picture is illustrative of what we have heard so much during this Conference. The planting of trees on the denuded hills and mountains means much to us as a nation.

I wish one question had been more discussed, and that is, how we are to preserve in the future the natural resources of our country so that they may be used for the benefit of all rather than exploited for the benefit of the few; and I hope and trust that the good work of taking back and restoring to the People those resources which have been fraudulently taken from them will continue.

There has been much said here about the duty of the States to the Nation, but I would like to call the attention of the Conference to the fact that there is much to do on the part of individual citizens in this great work, and when the State and the Nation blaze the way and point out the path we, as American citizens, still have much to do ourselves; there is work for us all, and we should not look entirely to the States and Nation to do the work for us. [Applause]

Gentlemen, I do not wish to trespass longer upon your time. I want to express my appreciation, as the other Governors have, of the privilege of being here. It is a fine thing for the Governors to have the opportunity of meeting, of becoming better acquainted with one another, and discussing the problems of the Nation.

I thank you, Mr President, for this opportunity to express my appreciation at being present at this Conference. In closing, I will say that Nebraska, the State which has less illiteracy than any other State in the Union, will endeavor to do her part. [Applause]

The **President**: I have been asked on behalf of the National Rivers and Harbors Congress, which will hold its Fifth Annual convention here December 9–11, next, to invite the members of the Conference to attend.

Mr **Holland**, of Texas: Mr President, our Governor was not able to be present on this occasion; but, Mr President, the Lieutenant-Governor of Texas is here. I am sure we would like to hear from Lieutenant-Governor Davidson. [Applause]

ADDRESS BY A. B. DAVIDSON

LIEUTENANT-GOVERNOR OF TEXAS

Mr President and Gentlemen of the Conference:

I presume the time has now about been reached when Lieutenant-Governors may be heard from. I will therefore detain the Conference a few moments, but only a few moments, as I understand Lieutenant-Governors are expected on all occasions to do.

I understand the purpose of this Conference is one of education; and if some gentleman will hand me a cane, I will be able to illustrate some facts on this map. [A cane was passed to the speaker]

Now, Mr President, I have a big stick. [Laughter] I use the big stick at home when the Legislature is in session, and I hope I may have your permission and consent to use it here for a while.

The PRESIDENT: Certainly.

Lieutenant-Governor DAVIDSON: Gentlemen, I would like to illustrate on this map one or two conditions that confront our entire territory in [pointing] the upper Panhandle section of the States of Texas, New Mexico, and Colorado. I would like to call your attention to the necessity of irrigation in that section, not only in our own State but in the other territory lying north and northwest of it, and show you, if I can, what might be accomplished by damming and filling the canyons of this section. Those of you that follow me will see that the trend of the Gulf of Mexico, after leaving the mouth of the Mississippi river, circles around to the coast of Texas and then turns southward again along the Gulf front of the Republic of Mexico, down by Tampico and Vera Cruz. The trend of the winds from the Gulf of Mexico is over Louisiana and about two-thirds of the State of Texas; these winds are almost constant over the sections indicated, and they are almost constant in the same direction—that is, from southeast to northwest over the upper portion of Texas, New Mexico, Colorado, and Arizona.

An examination of the direction in which the Gulf coast turns after reaching the Mexican Republic will show that the south wind, that possibly furnishes the moisture from the Gulf coast country to the greater portion of Texas, Louisiana, Indian Territory, New Mexico and Arkansas, does not, when it reaches the neighborhood of the 99th meridian, originate or come from the Gulf of Mexico, but comes from the dry, mountainous country of the Republic of Mexico; so that possibly from this, that section of our State lying west of this meridian, together with Arizona and New Mexico, is now and always will be what is known as the dry belt of the Union. Of course it has a certain amount of rainfall, but not to the extent that that territory lying east of this meridian has, and not sufficient for agricultural purposes. This dry section is magnificent country, the greater portion of it rich in soil and adapted to the cultivation of corn, cotton, wheat, and almost every variety of farming products known to the Union. At least this section is dry, and as that lying east of the 99th meridian has an abundance of rain, certainly the natural conditions indicated must have something to do with the dryness of that lying west of it.

The Governor of Alabama has just said that Alabama has more water and less channels than possibly any other State in the Union, but I want to say that Texas has possibly more channels and less water than any State in the Union, and that the channels lie largely in the dry section that I have just referred to. Immense channels are cut by the waters of the Guadalupe, Colorado, Brazos, and Red rivers as they come out of the higher plains of the Panhandle section of the State of Texas; immense quantities of water can easily be obtained for irrigation purposes at comparative little cost if these channels are locked and dammed, and reservoirs created in that way.

We can not under the Constitution of the State of Texas, and possibly will never be able by the adoption of a Constitutional amendment, use the State funds to build these dams and reservoirs in the section indicated; but if the Federal Government has the power and should indicate an inclination to use its resources to the end that irrigation might be encouraged and supported in that section by the building of these reservoirs and dams, I want to say, Mr President, that so far as the State of Texas is concerned, it will be ready and willing to act with the Federal Government under such conditions as will protect its own rights, but at the same time permit the work to be done.

Again, Mr President, most of the streams east of the 99th meridian are navigable for many hundred miles in the interior of the State, requiring but little improvement; Red river is navigable for many hundreds of miles, the Trinity to Dallas, the Brazos to Waco, the Colorado possibly to Austin, and the Guadalupe certainly to Cuero, Texas; and by locking and damming these streams they could be made navigable, as above stated, and a vast water supply would be furnished that territory, as well as power that could be and would be used for manufacturing purposes.

The Federal Government can alone improve these rivers and control the navigation of them. Incident to this improvement, there would be water power created that would manufacture, if properly utilized, all of the cotton products of the State of Texas. For instance, if we take Guadalupe river alone, there would be developed enough power to manufacture every bale of cotton raised in the watershed or basin of that river. I do not believe I am exaggerating when I say that the valleys of the Guadalupe raise an average of 300,000 bales of cotton every year. The National Government could control, if it saw fit, the navigation of these streams, and the State could reserve the right to regulate the power and manufacturing establishments that might be developed along their course.

We have the power to control corporations, and we have the power to control individuals; and manufacturing plants that may be built up would be under our control, and the navigation would be under the control of the Federal Government. The two can harmoniously work together, and we in Texas are ready to act.

The Guadalupe river in our State is the most splendid stream within its border and has a great water supply, and its water supply is constant and never-failing. If there is anything in the theory that building of locks and dams and the gathering together of large water supplies would aid the insufficient rainfall in this territory, then this stream presents, so far as we are concerned, a most desirable condition for experimental purposes. It is farthest south of any stream in Texas; and, as I have before explained, to the northward the evaporation from it would add to the rainfall wherever and whatever such conditions do, or would, add to aid the rainfall.

If the Federal Government wants to build these locks and dams, let it indicate its willingness, for the streams are not worth anything as they are.

Mr President, if you can by this Conference solve these difficulties and make the dry sections productive as the other sections are in our State, we will put into cultivation three times the amount of cultivated land that there is today. There is very little of it that is not productive, and if, Mr President, you, aided by these conferences, will solve this matter for us, I can tell you that we will furnish you cotton enough for the people of the world; we will furnish you wheat enough for the people of this country; we will furnish you with leather, for it is a magnificent cattle-raising section, and with beef that will not need any formaldehyde to preserve it, because it is fat enough to preserve itself. We will add to the State's wealth immensely and do our part toward the advancement of the Union by making that section as fertile as the other.

The invitation, Mr President, to attend this Conference has been responded to by almost all the States, and I regret that the Governor of Texas could not be present. We have been sending delegation after delegation to Washington to encourage the opening of our rivers, and we are here again to discuss this question of locking and damming our streams not only for the purpose of navigation but to add to the natural resources of the country; certainly if we manufacture by water-power, and use coal and oil only as fuel for that class of machinery that must move from point to point, like railways and steamships, it would greatly aid in protecting the combustible fuels.

We are determined, Gentlemen, notwithstanding we live down in that far section of the Union, to be here every time; and like the Governor of Washington has said to us, although we are a long way off, we are in the Union, and we will send delegates here, or elsewhere, whenever these matters are to be considered, and especially when together with so distinguished a person as the President of the Union; and if we can get assistance, we are ready to accept it; and if we can build dams across the rivers and canyons of the upper section of the State, the National Government can control these locks and we will take care of the power.

I might suggest in the way of an apology for the Governor's absence, that we recently had in Texas, as many of you may know, a political disturbance, and I reckon you are familiar with it. I am glad you are not in it. The Governor, I think, is trying to pour oil on the troubled waters down there. [Laughter and applause] Whether it will take an abundance of water to cleanse it, or whether it will take an abundance of oil to keep it greased, we do not know; but he could not come, anyway. It may get so hot that we may have to ask the Federal Government to help us cool off, [laughter and applause] and we may have to build a few reservoirs that we may have water enough to keep cool.

Now, Mr President, in behalf of the Governor of Texas, and the splendid citizenship of the State of Texas, I beg to thank you for the invitation extended to us to be present, and to say to you when the business affairs and natural resources of our State are under discussion, we will gladly and at any time send representatives to any meeting, to add what we can to the furtherance of such meetings and the final successful solution.

I thank you very much for the opportunity of addressing you. [Applause]

The PRESIDENT: Mr Louden of Iowa is recognized.

ADDRESS BY WILLIAM LOUDEN

Mr President and Gentlemen of the Conference:

I have the honor to represent, in part, the great State of Iowa, the first agricultural State in the Union.

I am sorry that Governor Cummins, owing to sickness in his family, could not be present. I know he would be glad to meet the Governors of the various States, and to participate in the discussion of the questions before the Conference. We sincerely regret his absence. President

Storms, of the State Agricultural College, one of his advisors, was also unable to attend. So Mr Earle and myself are the only representatives from Iowa—unless we include Secretary Wilson, who is big enough to represent both the State and the Nation. [Applause]

In the presence of so many distinguished men, perhaps it would be better for an ordinary Conferee to listen and say nothing; and yet I feel that some one should say a word for Iowa in a national Conference of such importance. I have therefore prepared a short paper embodying some thoughts on the policy of conservation, practically considered. I will not take your time to read it now, but will simply give you a synopsis and ask that it be printed in the published Proceedings in the following form:

Perhaps it might be an exaggeration to say that the importance of this Conference can not be overestimated, but I wish to emphasize what has already been said on this point. The American People have been rushing along at lightning speed, developing industries and consuming their natural resources until the time is at hand when something effective must be done to prepare for the contingencies of the near future if the country is to be left intact for coming generations. Far-seeing men have been displaying danger signals for some time, but we have been too busily engaged with the work of the present to pay attention to the needs of the future. Therefore the necessity for some extraordinary means to attract our attention to approaching dangers. This, I believe, has been done by this Conference in a manner more marked than could have been done by any other means. Hence its supreme importance.

In alleging short-sightedness, I do not wish to be understood as framing an indictment against the American people for lack of intelligence in the conduct of business. In the main, they have acted naturally, and, to a certain extent, properly, and just as any other people would have done under similar circumstances. Our ancestors came mostly from Europe, where the average conditions of life were hard. There was little opportunity, except for a favored few, to accumulate property or to do more than merely make a living. They found here a land filled to overflowing with natural resources of every kind, and rich beyond compare. All they had to do was to reach forth and help themselves. There was a thousand times more than they could use. Labor was scarce, and there was but little demand for surplus products. What little demand there was came mainly from abroad, and was mostly for products to feed the hungry millions of other lands.

The early settlers of Ohio, Indiana, and other States found timber everywhere which they could neither use nor give away. It encumbered the ground so they could not raise wheat to sell abroad. They did what any other people would have done under like conditions. They cut down the timber and burned it, and sowed the land with wheat. Today the timber would be worth fifty times the price of the land; but they did not see it then, and if they had they could not have waited for returns. The preservation of the soil was on a par with the saving of the timber. The original Government price for the best of land was $1.25 per acre, and later it declined to the cost of a homestead entry. Millions of acres were given away for the building of railroads to induce the settlement of the remaining land. In many of the older settled sections, a whole acre of improved land was scarcely worth a month's wages, while in some of the newer parts a week's wages would buy it. Under such conditions it did not pay to devote labor to the preservation of the soil. And so it was with all our other resources.

As the country developed the general trend of procedure was changed only to a slight degree. Machinery was invented to supplement labor, and business operations of all kinds were extended and enlarged to an extent never before known. This was necessary to make the use of machinery more profitable, and to enable the operator to extract the largest amount possible from the natural resources in the shortest possible time. There was neither time nor inclination, nor apparently any necessity, to consider the conservation of resources. In fact, it was the direct antithesis of conservation. It was a period of exploitation which had to run its course.

It was only in recent years that conditions became suitable to call attention to the policy of conservation; and even yet, from a strictly economic standpoint, there are many obstacles in the way, notwithstanding its supreme importance to the future. Labor is too scarce and high in comparison with the price of land and of commodities to do many of the things which are done to advantage in Europe. In addition to this, the American People, during their exploitations of the last hundred years, and especially the last fifty years, have contracted many habits which will have to be changed before a policy of conservation can become a marked success. We are now in the heyday of a material prosperity greater and more bewildering than was ever before experienced by any people in the history of the world. We have been taught that the highest ambition in life is to make the most of our opportunities, and this we have interpreted to mean the getting of all we possibly can out of the present without paying much if any attention to the interests of the future. Having succeeded so well in the past, we have naturally acquired an abundant confidence in our ability to overcome all obstacles, and therefore do not anticipate anything in the future which we can not master.

All of these things, and many more, operate more or less against a policy of conservation and will have to be overcome or modified before it can be successfully put in operation. How this can be done is the great question to be solved by the American People. It will be no small task to change the habits of a lifetime of extravagance and waste to those of economy and saving; especially when the economy and saving are mostly in the interests of the future. It will be difficult to substitute the business methods necessary in a policy of conservation for those which have been developed under the conditions of a superabundance of natural resources. Economic considerations alone will never do it; at least, not until compelled by the stern hand of necessity, when irreparable damage will have been done. There must be higher and nobler motives—motives altruistic and philanthropic in their nature.

The policy of conservation must become largely a patriotic duty instead of merely an economic problem. It must be considered in that broad enlightened spirit which can see the highest good of each in the highest good of all; that will consider and safeguard the well-being of posterity as tenderly and thoughtfully as it would the well-being of the babe in arms. If looked at from a purely selfish standpoint it should be that broader and more far-seeing selfishness that can discern the better and more essential things of life, that can distinguish between the grosser things—the cheap and tawdry tinsel—and the higher and nobler things which constitute the true worth of manhood, that makes for better health of mind and body and more perfect happiness for ourselves and our posterity. We live and labor largely for our children, but frequently we bequeath them things which are not the most conducive to their welfare. We strive late and early to leave them a large bank account, but sometimes it proves a detriment instead of a blessing. There are, however, things which will always prove blessings. Among these is robust moral and physical health. Another is a country unimpoverished by the exploitations of human greed, and one in which industry, intelligence, and virtue will always count for more than accumulated material wealth.

I mention these things because I believe their due consideration is essential to a truly successful policy of conservation. Much may be accomplished by legislative enactments, either State or National, or both, in the way of establishing forest reserves, encouraging the planting of trees, preventing the erosion of the soil, improving waterways, regulating the disposition of sewage, and in many other ways. However, as compared with what can be done by law, infinitely more can be done by the right kind of education. In the first place, the right kind of education is necessary to create a public sentiment to enforce the law, which, if enacted without a full understanding and appreciation of its purpose and the means needed to enforce it, will soon fall into disrepute if it is not repealed. In the next place, this education will lead people to do the things which should be done without the compulsion or expense of the law, and will be, in itself, the most practical kind of conservation. Lack of available knowledge is the greatest handicap of the human race, and causes greater wastes than everything else combined. The right kind of education will largely take the place of penal statutes, and one of the greatest and best things which can be done by legislative enactment is to make ample provision for this education.

By the right kind of education I do not mean the ordinary theoretical and speculative education which has heretofore obtained too largely in our institutions of learning, but that newer and better and wiser practical education which will enable all to know and do the things which must be known and done aright every day and hour to make our lives truly successful, useful, and happy. The old-style higher education which came from the monarchies of the Old World was never intended for nor suited to the needs of all the people. Outside of what was required by the learned professions, it was mainly designed for the nobility, who did not have to make a living for themselves. It was too largely speculative and legendary. Its chief object was to enable its possessors to appear well in society, to talk learnedly of things about which they knew nothing practically, and to boast well of the reputed exploits of their ancestors.

It never taught them economy nor how to be generally useful, but always to spend and waste and live on the labor of others. Many of the defects of this old education have crept into the educational systems of this country, and while many improvements have been made looking to something more practical and more suited to the needs of the American People, much yet remains to make it thoroughly practical and up-to-date. In taking up the question of conservation, nothing more effective could be done than to begin at the foundation—the schoolhouse—and remodel our system of education to meet the requirements of the people, physically as well as morally and materially. Efforts in this direction are already being made, and these efforts should be seconded in every practical way.

So far as our natural resources are concerned, the soil is by far the greatest, if it does not surpass all the others combined. From it, and it alone, we must get our daily bread. In addition to this, when our deposits of coal and iron become exhausted it will probably have to furnish the fuel and other necessities of life. It is also the most responsive to proper treatment and, as affected by a policy of conservation, is the most promising of all our resources. When coal or iron is used once, that is the end of it, as there is no known means of renewing it. Timber may be re-grown slowly, but it is so slow and expensive that, under present conditions, there is little or no profit in it so far as monetary considerations are concerned. Forests are beneficial to the soil and the waterways, and to promote the health and comfort of mankind, and therefore it should be a religious duty for every person to plant at least one tree every year. "The groves were God's first temples;" and a treeless country is but little better than a desert. Especially should nut and fruit trees be planted everywhere.

All the soil requires is proper treatment, and it will last for all time and may even be improved while it is used. Of course, it will be difficult if not impossible to get our soil back to the original fertility it first possessed, but it can easily be improved from its present condition. Farms have been worked for a thousand years in Europe and Asia, and by proper care have retained their productive powers. Barn-yard manure is the cheapest, most practical, and best of all fertilizers. I would like to go into this subject exhaustively, but can not spare the time to do so here. I believe it would be a valuable help if manufacturers and business men generally could be induced to furnish information in regard to preserving the fertility of the soil. In this way thousands could be reached and influenced for good who could not be reached by bulletins of the Agricultural Department or by public documents. I also desire to endorse the able address on this subject of Mr James J. Hill, the great railroad builder, financier, and student of economic questions, which was delivered at this Conference.

One of the most influential factors in the present well-being of this country and in the perpetuity of our Government was the 550,000,000 acres of virgin soil which were reduced to cultivation during the last hundred years. This was a safety valve to relieve any pressure of discontent which at certain times might have developed. It was one of the greatest aids to the rapid and peaceful disbandment of the great armies of the civil war, which was the wonder of the world, and it has been the great source of our marvelous development of the past century. If there were only 500,000,000 more such acres to add to our available resources during the next hundred years the questions confronting us today would not be so pressing as they are. We can not much longer take Horace Greeley's advice to "Go west and grow up with the country." It will not be long until population will begin to recoil upon itself, and when that period has developed, unless we are fully prepared for it, the crucial test of our institutions will come.

This subject is one of incalculable moment. How we are to feed, clothe, and employ the teeming millions of the next hundred years and later is a question which may well appall every lover of his country. Do the best we can, the pressure of population will bear heavily upon our resources, and we are forced again to the fundamental questions already touched upon. There are just two things which can be done: One is to conserve our natural resources in every way possible; the other is to change the habits of the people from extravagance and waste to those of economy and saving. Both things will be necessary to solve the problem, and the greatest and most indispensable factor in accomplishing these results will be right education.

Fully as much, if not more, can be gained by saving the wastes of life as by saving natural resources. For instance, it is said on good authority that one acre will produce as much food for man in vegetables, grains, fruits, etc., as six acres will produce in meats. It is a well-known opinion that the American People eat entirely too much meat for their health and physical well-being. Recent tests at Yale by Professor Irving Fisher and others have demonstrated conclusively that, under the conditions of the experiments, flesh abstainers have greater endurance and better health than flesh consumers. Fifty years ago the diet of the American People was about 50% of meats; now it is said to be from 30% to 35%, and it could still be decreased one-half or more with great benefit to the people economically and probably from the standpoint of health and vigor. As populations increase, this will have to be done more and more.

It is also claimed that dairy products are from two to three times more economical than meat products, and are more healthful. These are subjects worth thinking about, and when we once begin to study we will be surprised at the savings we can effect in all directions. Look at the vast amount of the most productive land in the country, over 800,000 acres, which is devoted to the raising of tobacco, which is held by authorities to be a positive damage to the race, the greatest damage being to the unborn millions yet to come. Also, see the colossal wastes of foodstuffs in the manufacture of intoxicating liquors which, in their effects, are a greater curse than war, famine, and pestilence. This is not all, but it is surely enough to open our eyes and set us to thinking. I can not refrain from citing the closing remarks of President Roosevelt on national efficiency. No more prophetic words could be uttered; and in my opinion the American People can not begin any too soon to grapple with this gigantic problem. I believe the two problems of conservation and efficiency are so interwoven and so interdependent in their relations with each other that it will be extremely difficult if not utterly impossible to separate them and solve them apart. I believe that when we come to see all the bearings clearly we will find that the improvident and, if I may use the term, riotous living which has done so much to destroy our natural resources, is doing far more to destroy the vitality of the race. History tells us that it was luxurious living, the usual accompaniment of great wealth, which destroyed the great civilizations of the past. If this is true, then the most vital problem before us is how to escape this fell destroyer.

The President truly tells us that foresight is the great essential in a policy of conservation, but Professor Fisher shows clearly that a degenerate man is devoid of foresight; that he is ever willing to drift with the tide and trust to luck for the conditions of tomorrow. Hence the importance of preventing degeneracy, of correcting what degeneracy already exists, and of bringing the race up to the highest possible state of efficiency. You can not reason with a man about any important matter, especially if it reaches into the future, when he is intoxicated, and it makes little difference whether the intoxication is caused by liquor, or by food poisoning in the system, or is brought about in any other way. The understanding is befogged, the reason is befuddled, and the man is incapable of clear conclusions, especially on matters of wide importance. That is the trouble with many people today, and it is one of the most cogent reasons that can be urged against the capacity of the people, generally, for self-government.

This degenerate condition must be corrected if we are to solve the problems before us, or if popular government itself is to endure. It takes a clear head and a steady nerve to properly handle any great question, and while we may rely to some extent on leaders, the only safe way is for the great majority of the people themselves to be capable of the most intelligent and far-seeing judgment. The enervating influences which have prevailed to a greater or less extent in this country have already done incalculable injury, and it is high time that the tide was turned in the right direction if the Nation is to endure. The virility of the race is not only to be preserved along with our natural resources, but it must be increased many-fold before this country will reach the high estate in the destiny of nations to which it is entitled, and which is demanded by the interests of humanity.

This is an endless question and I do not wish to continue it too long. I will only add that all means possible should be used to improve these conditions, and to my mind one of the most promising movements in this direction is the great National Health League which was recently organized, and of which Professor Irving Fisher of Yale is the head. I am fully convinced it is one of the most important movements ever inaugurated in this country. It has the unreserved support of President Roosevelt, who says that he regards "our national health as physically our greatest asset;" and it should have the active support of every citizen. The greatest wastes sustained by the American people are on account of sickness and disease—the loss of health and vigor; and yet there is nothing to which they devote so little intelligent thought or care.

It is estimated that we expend $4,000,000,000 per annum on account of sickness and disease. Over 4,000,000 persons are constantly sick, bringing sorrow and trouble and expense to over 5,000,000 homes, directly affecting the welfare and happiness of probably 25,000,000 people, and indirectly affecting the interests of all. And yet, the best-posted scientists claim that at least one-half of all this enormous sum could be saved by proper living, which would more than double the happiness and vigor of the people and render them much more capable to deal intelligently with the perplexing problems before them. Nothing better could engage the attention of those who are interested in the conservation of our natural resources.

In conclusion, I have the utmost confidence in the ability of the American people to solve all problems if they will only take the time necessary to study existing conditions thoroughly, and kindly and thoughtfully devise ways and means to accomplish desired results. Our forefathers met and solved wisely and well the problems before them. Other and greater problems now confront us; let us meet and solve them with the same patience, the same foresight, and the same patriotic devotion to country and posterity, and all will be well.

Mr President, I thank you and the members of the Conference for your kind attention. [Applause]

Mr **Bryan**: Mr President, I offer the following resolution:

Resolved, That this Conference records its deep regret that Ex-President Cleveland is prevented by sickness from participating in this historic meeting; and that, in extending to him a cordial greeting, it expresses a sincere wish for his speedy recovery.

[Applause]

Mr President, I move the adoption of the resolution.

The motion was seconded by several voices.

The **President**: The resolution is before you. If there is no objection, I will declare it adopted by acclamation. [Applause]

The motion is unanimously adopted.

Governor **Blanchard**: Mr President, there may be other gentlemen who have not had an opportunity to speak either today or the two previous days of this Conference, but who have gone to the trouble of preparing remarks. I move that all such Conferees, whether they be Governors or gentlemen who have been invited here as assistants to the Governors, be permitted to have their speeches or remarks printed in the official Proceedings of the Conference.

Governor **Mead**: Mr President, I would suggest, with your permission, that a committee be appointed to edit, because there might be some things submitted that would simply be repetition.

The **President**: I understand, Governor Blanchard, that your motion refers particularly to the gentlemen who were to read statements today, but who have not had an opportunity to present them, that those papers shall be printed in the Proceedings?

Governor **Blanchard**: Yes, sir.

The **President**: If there is no objection to that, it will be so ordered. [After a pause] It is so ordered.

Governor **Hoch**, of Kansas: Mr President, I understood Governor Blanchard's suggestion to cover a somewhat wider range. I understood his motion to include all those gentlemen who have not spoken at all, but who have papers or remarks that they would like to submit, that they may have the opportunity of filing them, and that such remarks or addresses will be printed in the record. I should also like to suggest that those who have spoken, but did not have prepared papers, be permitted to prepare their papers and furnish them for printing.

Governor **Blanchard**: I accept the suggestion of the Governor from Kansas, that the gentlemen having the privileges of this Conference who desire to prepare papers be allowed to file them, and that they shall be printed as part of the Proceedings.

The **President**: Has an editing committee been appointed? There should be, I think. Let me suggest that the papers be submitted to the Resolutions Committee, to be passed on by them before being printed.

Governor **Blanchard**: The objection to that is that all the gentlemen composing that committee are likely to leave the city today. For one, I must leave tonight; and, therefore, I do not think it practicable for the Committee on Resolutions to undertake that duty.

The **President**: You could depute it, Governor.

Governor **Blanchard**: With that understanding, Mr President, the Committee will undertake that duty.

And now, Mr President, this Conference having accomplished its mission, I do now move that the Conference adjourn sine die.

The motion was seconded by Governor Davidson and others.

The **President**: Gentlemen, you have heard the motion. Before putting it, let me extend a word of thanks to all of you, to the Governors and the other guests, for coming here. The White House has held many distinguished gatherings in its day. I do not believe it has ever held as distinguished a gathering as this, composed of the Executives and representatives of the Executives of all the States of the Union. I thank you for coming; and I can assure you that, at least, no body of guests has ever been more welcome than you have to the White House. [Great applause]

Thereupon, at 1:30 oclock p. m., the question having been taken on the motion of Governor Blanchard, and agreed to without dissent, the President declared the Conference adjourned sine die.

SUPPLEMENTARY PROCEEDINGS

OPENING STATEMENTS FOR SIXTH SESSION

CONSERVATION OF LIFE AND HEALTH BY IMPROVED WATER SUPPLY

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Water is a prime necessity to man not only as an article of food but also for the proper degree of cleanliness of person, clothing and dwellings. So homes sprang first into existence wherever nature yielded a bountiful supply of water. Look where we may, the land supplied with a spring or traversed by a stream constituted the first choice of our sturdy pioneers.

In our towns and cities the question of water supply has been solved by the introduction of public water works, but even these instrumentalities are not of modern origin, for in a visit to Rome we will be shown aqueducts covering miles on miles which were begun 312 B. C., many of which have been renovated, and attest the munificence with which the ancient capital was supplied with one of the first sanitary requisites.[a]

Sources of Water: The water which we require for our daily use comes to us from the clouds in the form of rain or snow. Of this a certain amount is evaporated; another portion may be collected in cisterns, another soaks into the earth to reappear in the form of springs, another portion flows off in the direction of surface slope to join the ponds, lakes, streams or rivers, or it may penetrate the earth sufficiently deep to require us to dig wells for its collection. The sources of our water supply may therefore be classified as rain and snow water, surface water (including ponds, lakes, streams and rivers), and ground water, including springs and wells.

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[a] According to Forbes, cited by Mason (Water Supply, 1897, p. 5), the entire length of the aqueducts in English miles would be 381, yielding a supply of 332 gallons per capita upon a basis of a population of one million, at a cost according to Pliny of $12,700,000.

The amount of water available for community purposes depends on the precipitation and the precautions taken in a given watershed for the conservation of the waters. The mean annual rainfall for different portions of the United States has been tabulated by the United States Weather Bureau; it averages some 30 inches.

Fanning gives the average of 40 inches for New England and the Middle States. One inch of rain would amount, according to Church, to nearly 101 tons per acre; or on a house roof of say 20 by 20 feet area, one inch of rain would be about 250 gallons. With a rainfall of 40 inches per annum this would amount to 10,000 gallons, or 27 gallons per day. The average daily supply per capita in most of our Northern cities ranges from 20 to 127 gallons or more.

PUBLIC WATER SUPPLIES

The needs for community water supplies are met according to the location of the town or city with reference to the availability of springs, streams, rivers and lakes. Since springs rarely yield a sufficient supply of water for general use, it is perfectly natural that in the majority of instances surface water, like streams, rivers, lakes or ponds were utilized for public water works and when these were not available, recourse was had to shallow and deep wells and so-called filter galleries.

It is interesting to note that according to M. N. Baker[a] the number of towns in this country before 1800 having a public water supply was only 16, supplying about 2.8% of the existing population; in 1850 there were only 83 public water works, supplying about 10.6% of the census population; in 1897 the total number was 3,196 supplying about 41.6% of the population. The number has greatly increased, but exact information is not available.

COMPOSITION OF RIVER WATER

River water is a mixture of spring, ground, rain, and surface water. The English Rivers Pollution Commission in its Sixth Report estimated that about one-half of the water descending as rain finds its way into streams. Rivers are always purer near their source; the amount of impurities increases as we descend the stream, since the water-courses are the natural drainage channels of the country and the wastes of human life and occupation find their way into the streams It is for this reason that rivers, after passing through cultivated valleys with cities, towns or settlements along their banks often contain a dangerous amount of mineral and organic matter. Thus the Mississippi at Minneapolis contains only 18.6 total solids per 100,000, while the same river at St. Louis contains 244.3 per 100,000.

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[a] Manual of American Water Works, 1891 and 1897

RIVER POLLUTION—RELATION BETWEEN PURITY AND CLARITY

The sanitarian recognizes two principal forms of pollution; first, the amount of mineral matter, and second the character and amount of organic matter contained in the water. The amount of mineral matter depends largely on the geological formation of the country and the erosive power of the streams. Water containing 50 parts per 100,000, or 30 grains of solid matter per gallon is unfit for drinking purposes on account of its irritating effects upon the gastro-intestinal tract; but beyond this, turbidity is of no special sanitary significance unless the water also contains metallic poisons or objectionable chemicals.

POTOMAC RIVER

Potomac river, which may serve as a type of American rivers for our discussion, is subject to various forms of pollution. For example certain pulp mills, tanneries and manufacturing establishments defile the water by chemicals and other refuse—one paper mill alone discharges over 100,000 gallons of liquid into the river each day, heavily laden with sulphuric and tannic acids.

These forms of pollution, although at times so great as to prove destructive to game fish, are of less interest to the sanitarian than contamination with excrementitious matter from human beings or animals, within the towns and settlements of the Potomac basin; the drainage area of the river covers 11,400 square miles, with a population of 501,647 or 44 per square mile. Among the larger towns may be mentioned Cumberland, Frederick, Hagerstown, Harpers Ferry, Staunton; as none of these are wholly sewered, most of the contamination is derived from surface drainage.

CHEMICAL ANALYSIS

Notwithstanding these numerous sources of pollution, Potomac river, according to the chemical analysis, compares very favorably as regards purity with other American rivers. The following are the results tabulated for comparison and based on daily analyses of the Potomac water made by Mr R. S. Weston, between July 1, 1899, and January 20, 1900, and daily analyses made by Mr F. F. Longley in 1906 and 1907:

	Total solids.	Free ammonia.	Alb. ammonia.	Nitrites.	Nitrates.	Chlorine.	Required oxygen.
Robert S. Weston	139.0	.013	.105	.002	.73	2.60	4.50
F. F. Longley (a)	....	.013	.075	.088	.0035	1.70	
F. F. Longley (b)	....	.015	.078	.093	.0037	1.80	
Mason's safe limit	150–300	.01–.12	.10–.28	.0135–.033	.42	3.10	5–7

(a) Average for 1906. Turbidity, 142. (b) Average for 1907. Turbidity, 97.

BACTERIOLOGICAL ANALYSES

Bacteriological examinations of this water have been made by various competent authorities at the Army Medical Museum, and by Kinyoun and Sprague, of the Public Health and Marine-Hospital laboratory. The latter also examined samples at or near all the important towns from the head waters of Potomac and Shenandoah. These samples may be said accurately to represent the bacteriological conditions of the entire river, and intestinal organisms were found in over fifty per cent of the specimens examined. The more recent examinations conducted by Mr F. F. Longley, Chief Chemist of the Washington Filtration Plant, show that of 906 samples tested, 45% revealed the presence of the *bacillus coli communis* which belongs to the sewage group. The germs are always more plentiful during colder months, because of the fact that in winter much water runs in over the surface from manured fields and the purifying agencies are less active.

TURBIDITY AND BACTERIA

These exhaustive studies also confirmed the conclusions of Theobald Smith and the writer, that turbidity of the Potomac water is always accompanied by a larger amount of organic matter and germs, and that fecal bacteria and turbidity are coincident, simply because the same showers that bring along large sections of pulverized river banks also wash through towns, barnyards, cesspools and outhouses before finding their way into the creeks and rivers.[a]

The presence of intestinal bacteria is satisfactory evidence of contamination with fecal matter of man or animals. Apart from the fact, which it conclusively shows, that much valuable organic matter has been carried away which should have been retained in the uplands for manurial purposes, the presence of sewage bacteria is significant of danger and strongly points to the possibility that such waters may be infected with typhoid bacilli.

It has been estimated that the sewage from the vicinity of Cumberland, a distance of about 134 miles, requires from two to four days to reach the Washington Aqueduct. We also know that typhoid germs retain their vitality in ordinary water from six to ten days, and could therefore infect consumers of water in Washington.

My suspicions that typhoid fever germs may travel all the way from Cumberland were confirmed as early as the winter of 1889–90 by study-

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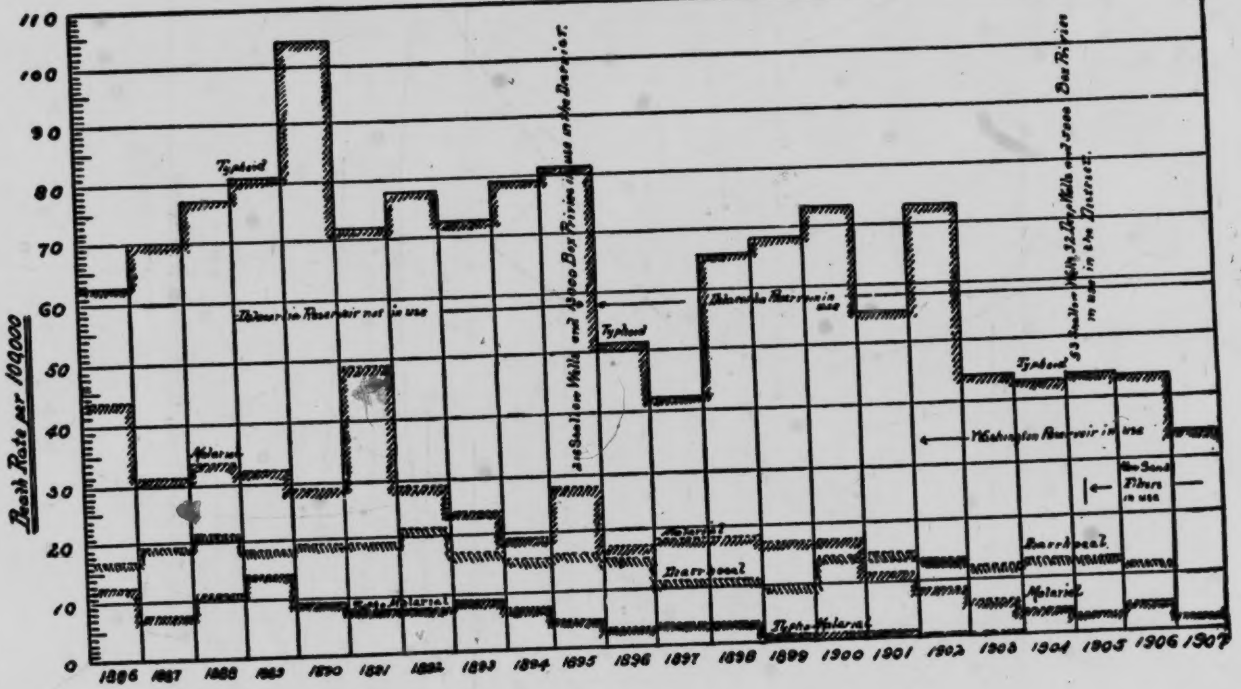
[a] Mr Longley's examinations covering a period of 27 months show that a wave of high turbidity is always accompanied by a very high bacterial content, the maximum number of bacteria per c. c. in the raw water was 175,000 during a period of highest turbidity; the minimum number per c. c. was less than 100 during a period of lowest turbidity, with an average during the entire period of 4,852.

EFFECT OF WATER PURIFICATION ON DEATH RATES FROM TYPHOID FEVER, MALARIAL AND DIARRHEAL DISEASES IN WASHINGTON, D. C., PER 100,000 OF POPULATION.



ing the effects of the typhoid fever epidemic at Cumberland upon the prevalence of the disease in Washington. The records of the Health Office show that during this epidemic, from December, 1889, to April, 1890, the deaths from typhoid fever amounted to 74, as compared with 42 for the corresponding months of the previous year. Indeed, we had almost double the number of typhoid deaths during these months than occurred in any similar period either before or since this epidemic.

The accompanying chart shows that this epidemic resulted in the highest typhoid mortality rate ever reached in this city, viz, 104 per 100,000 (see diagram).

Cumberland during these four months had 45 deaths and 485 cases, Washington had 74 deaths and about 740 cases, and yet the starting point was the excreta of one patient washed into a little run which empties into the Potomac about 300 feet above the pumping station of the water supply for Cumberland.[a] In the face of this fact, and the almost constant presence of intestinal bacteria, I had no hesitation in declaring that a considerable proportion of typhoid fever in the National Capital was due to infected Potomac water, and with other members of the Medical Profession urged its purification (see cut).

The accompanying chart copied from Mr Horton's diagram in the Engineering News, November, 1906, contains similar data collected and presented by the writer to the Medical Society and to the Senate Committee in February, 1898, shows conclusively that the typhoid fever rates were highest when the Potomac water was served in a raw state without any preliminary purification whatever.

The Dalecarlia Reservoir was not in use as a sedimentary basin from June 20, 1886, to July 28, 1895. Mark the comparatively high typhoid fever rates, especially during the Cumberland epidemic which started in December, 1889. Mark the decline, especially after the installation of the McMillan Reservoir in 1902. The sharp rise in 1902, in the light of our knowledge of bacillus carriers, may possibly be explained by the assumption that during the construction of the tunnel and reservoir more or less pollution took place by careless workmen.

The diagram is also instructive in showing a remarkable decline in the deaths from malarial and typho-malarial fevers and diarrhœal diseases. There is little doubt that many of these cases were really typhoid fever, and that the decrease in typhoid fever is, in fact, very much greater than appears from the mortality returns.

When we recall the fact that deposition of sediment alone removes 87% of the bacteria in our local water system, we can readily appreciate what Professor Sedgwick has said "that the purifying effect of these sedimentary basins was immediately to remove from the polluted river water a large percentage of any typhoid fever germs present at the intake, and thus to forestall to a remarkable and unforeseen extent the burden of removal which the filter was expected to bear." It should also be borne in mind that during the year 1906 typhoid fever prevailed in Cumberland to an unusual extent, but, contrary to the experience of 1890, we had no increase; hence it may fairly be presumed that the filtration plant, as expressed by Dr Magruder, "stood as a guard between the inhabitants of Washington and Cumberland." The typhoid rate in 1907 was only 34.59 per 100,000, which is the lowest rate ever reached, and certainly a remarkable reduction from 104 in 1890.

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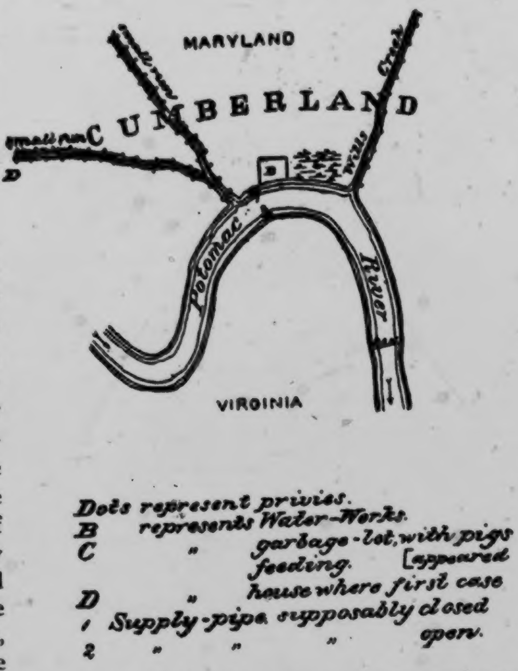
[a] The writer is indebted to Dr W. W. Wiley, of Cumberland, for a detailed account of the epidemic in a personal communication dated June 25, 1890.


MARYLAND
CUMBERLAND
small run
D
B
Creek
Wills
Potomac
River
VIRGINIA
Dots represent privies.
B represents Water-Works.
C " garbage-lot, with pigs feeding. [appeared
D " house where first case
1 Supply-pipe supposably closed
2 " " " open.

OTHER AMERICAN RIVERS

What has been said of Potomac river is equally applicable to the Ohio, Mississippi, Merrimac, Connecticut, Missouri and other American rivers, because they are the sewers and at the same time the source of water supply for nearly all the cities located on their banks. These cities show, moreover, a marked prevalence of typhoid fever, thus confirming what has been observed over and over again, that this disease, as also cholera, dysentery and diarrhœal diseases can be carried from one town or city to another by means of inland waterways. Indeed, the question is one of extreme interest even to the residents along the Great Lakes, the basin of which according to the Census Statistics (especially the area contiguous to Lakes Ontario, Erie and Michigan), is next to the Atlantic seaboard the most densely populated area of the United States; we know that large cities like Buffalo, Erie, Cleveland, Detroit, and Milwaukee discharge their sewage into the Lakes, and we also know how Chicago and Cleveland suffered from typhoid fever visitations by contaminating their own water supplies. It is also a well-known fact that many of the river cities were obliged to resort to purification of their water supplies in order to arrest the ever-increasing typhoid fever wave.

INFLUENCE OF WATER SUPPLIES ON TYPHOID FEVER DEATH RATES

For the purpose of determining the influence of public water supplies on the typhoid fever death rates in general, Mr M. O. Leighton, Chief of the Water Resources Branch of the United States Geological Survey, very courteously complied with my request for a list of the principal American cities with a population of over 30,000, classified according to the sources of their water supply. Dr Cressy L. Wilbur, Chief Statistician of Vital Statistics, Bureau of the Census, with equal promptness and accuracy furnished me the death rates from typhoid fever for the calendar years 1900 to 1906 inclusive, these being all of the years for which annual returns of deaths have been received by his office.

In order to give a general view of the relative death rates, Dr Wilbur has computed the mean rate (not the average annual rate, which, however, differs only slightly for the five years 1902 to 1906), and has arranged them in the accompanying diagram. It has been necessary to omit certain cities, either because the information supplied was not of an entirely definite character or because the city was not accepted as a registration area for the whole or a part of the period covered. This diagram is also restricted to cities in which, according to the information supplied, there has been no special means of purification during the period covered. For detail information consult the tables on pages 264–271. Each city should be studied by itself.

The available statistics, in spite of the many factors concerned in the dissemination of typhoid fever, conclusively show that the water supply plays the most important role in the spread of the disease. A summary of the typhoid fever death rates is here given:

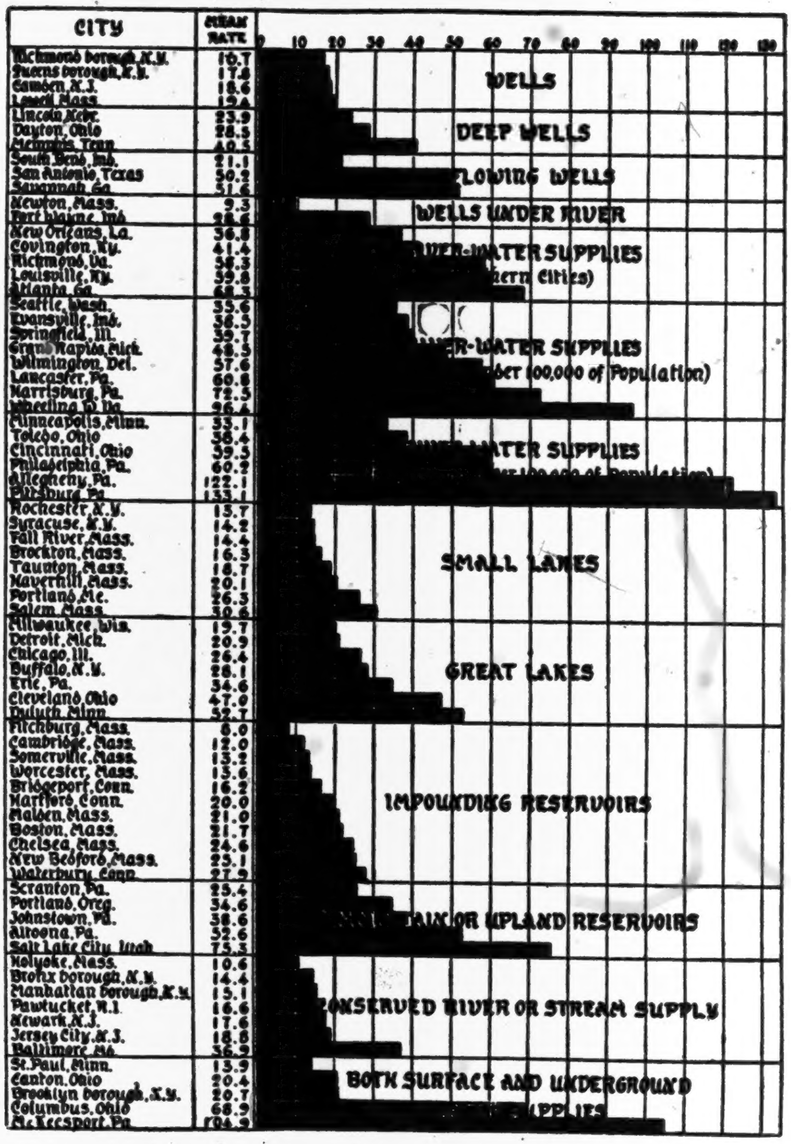
Mean typhoid fever death rate from 1902 to 1906 per 100,000 of population.

Four cities using ground water from large wells	18.1
Eighteen cities using impounded and conserved rivers or streams	18.5
Eight cities using water from small lakes	19.3
Seven cities using water from the Great Lakes	32.8
Five cities using both surface and underground water	45.7
Nineteen cities using polluted river water	61.1

The rates for cities using unpurified river water fluctuate from 33.1 at Minneapolis to 122.1 at Allegheny and even 133.1 at Pittsburg.

TYPHOID FEVER: 1902 TO 1906

DEATH RATE PER 100,000 OF POPULATION



CITY	MEAN RATE
Richmond borough, N.Y.	16.7
Queens borough, N.Y.	17.8
Camden, N.J.	18.6
Lowell, Mass.	19.4
Lincoln, Nebr.	23.9
Dayton, Ohio	28.5
Memphis, Tenn.	40.5
South Bend, Ind.	21.1
San Antonio, Texas	50.2
Savannah, Ga.	51.6
Newton, Mass.	9.3
Fort Wayne, Ind.	28.6
New Orleans, La.	36.8
Covington, Ky.	41.4
Richmond, Va.	38.3
Louisville, Ky.	39.8
Atlanta, Ga.	68.3
Seattle, Wash.	35.6
Evansville, Ind.	38.3
Springfield, Ill.	39.7
Grand Rapids, Mich.	48.5
Wilmington, Del.	57.6
Lancaster, Pa.	60.8
Harrisburg, Pa.	72.5
Wheeling, W. Va.	96.4
Minneapolis, Minn.	33.1
Toledo, Ohio	38.4
Cincinnati, Ohio	39.5
Philadelphia, Pa.	60.9
Allegheny, Pa.	122.1
Pittsburg, Pa.	133.1
Rochester, N.Y.	13.7
Syracuse, N.Y.	14.2
Fall River, Mass.	14.4
Brockton, Mass.	16.3
Taunton, Mass.	18.7
Haverhill, Mass.	20.1
Portland, Me.	26.3
Salem, Mass.	30.6
Milwaukee, Wis.	19.7
Detroit, Mich.	20.9
Chicago, Ill.	26.4
Buffalo, N.Y.	28.1
Erie, Pa.	34.6
Cleveland, Ohio	47.0
Duluth, Minn.	52.7
Fitchburg, Mass.	8.0
Cambridge, Mass.	12.0
Somerville, Mass.	13.2
Worcester, Mass.	13.6
Bridgeport, Conn.	16.2
Hartford, Conn.	20.0
Malden, Mass.	21.0
Boston, Mass.	21.7
Chelsea, Mass.	24.6
New Bedford, Mass.	25.1
Waterbury, Conn.	27.9
Scranton, Pa.	25.4
Portland, Oreg.	34.6
Johnstown, Pa.	38.6
Altoona, Pa.	52.6
Salt Lake City, Utah	75.3
Holyoke, Mass.	10.6
Bronx borough, N.Y.	14.4
Manhattan borough, N.Y.	15.1
Pawtucket, R.I.	16.6
Newark, N.J.	17.6
Jersey City, N.J.	18.8
Baltimore, Md.	36.9
St. Paul, Minn.	13.9
Canton, Ohio	20.4
Brooklyn borough, N.Y.	20.7
Columbus, Ohio	68.9
McKeesport, Pa.	104.9

ECONOMIC ASPECT OF PURE WATER

Water pollution involves both economic and public health problems. Those who are interested in the economic aspect will find an admirable account in Victor Hugo's "Les Miserables," part 5, book 2, who claims that Paris casts 25 millions of francs annually into the sea. While it is true that the sewers of Paris discharge daily not less than 300,000 cubic meters of sewage into the river Seine, which before the establishment of their sewage farms was lost to the agriculturist, its actual value has been overstated by this brilliant author.

Von Pettenkofer[a] calculates the average amount of feces per annum at 34 kilograms and of urine 428 kilograms for each person. Fresh feces contain on the average 25% of dry solids with about 1.4% of nitrogen, while fresh urine contains from 4 to 5% of solids, with about 1.33% of nitrogen. Erisman[b] calculates, that the refuse of a city of 100,000 inhabitants amounts every 24 hours to 9 cubic meters of feces, 120 cubic meters of urine and 12,500 cubic meters of house waste waters; he does not include the sweepings. Uffelmann[c] estimates these at 140 cubic meters, or a total of 12,768 cubic meters a day, exclusive of the rainfall. The estimated money value of the refuse of a city of 100,000 upon the above basis is stated by Paltzow and Abendroth[d] to be not less than 3,600,000 marks or about $900,000 per annum; but these values, although conservative for German conditions, are quite theoretical and will depend largely on the demand for fertilizer.

THE HYGIENIC VALUE OF PURE WATER—ANNUAL COST OF TYPHOID FEVER IN THE UNITED STATES

According to the Census of 1900 there were 35,379 deaths from typhoid fever during the Census year throughout the United States; and based on an estimated mortality of 10% it is within reason to assume a yearly prevalence of 353,790 cases of this disease. If we calculate the average cost for care, treatment, and loss of work to be $300 and the average value of a human life at $5,000 we have a total loss in the United States of $283,032,000 from one of the so-called preventable diseases. Mr George C. Whipple[e] presents some striking evidence to indicate that a loss of $10,000 for every death from typhoid fever is a conservative estimate, in which case the decrease in the "vital assets" during the Census year of 1900 would amount to $353,790,000. Reduce the prevalence of this disease one-half (which has been accomplished in Europe and our own country), and the question of the hygienic value of pure water will be answered from an economic point of view.

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[a] V. Pettenkofer, Ueber Canalisation und Abfuhrwesen, München, 1876, p. 15.

[b] Erisman in V. Pettenkofer's u. v. Ziemssen's Handb. d. Hygiene II, p. 88.

[c] Handbuch d. Hygiene, 1890, p. 413.

[d] Cited by Erisman on p. 91.

[e] The Value of Pure Water, New York, 1905, p. 5.

Mr Whipple, while admitting that this is merely a transference of money from one man's pocket to another, emphasizes the fact that "unnecessary expenditure is a loss," and that deaths from typhoid fever and from other diseases represent a very material loss of the productive capacity of a community and consequently a decrease in what may be termed the "vital assets." On page 36 he computes, upon what may be regarded a very sound basis, that "each million gallons of polluted Allegheny river water pumped to Pittsburg has heretofore reduced the vital assets of the community by $110. This for a population of 350,000 amounts to $3,850,000 per year—a sum enormously greater than the annual cost of making the water pure."

In like manner he calculates that the increased value of the water to the city of Albany, where the typhoid fever rate was reduced from 104 to 26 per 100,000 by efficient filtration "amounts to $475,000 per year, of which at least $350,000 may be considered as a real increase in the vital assets of the city."

THE EFFECT OF IMPROVED WATER SUPPLY ON TYPHOID FEVER DEATH RATES

The table below and the diagram on page 249 show clearly the effect of change of water supply on typhoid fever death rates in seven American cities. Dr Wilbur, of the Bureau of the Census, has given the death rate for a considerable time before and after the date of change and also the average annual death rate before and after purification, and the percentage of reduction. From this table we learn that the combined average annual death rate from typhoid fever in cities with a contaminated supply was 69.4 and after the substitution of a pure supply it fell to 19.8 per 100,000; a reduction of 70.5%.

Table showing effect of change of water supply on typhoid fever death rate

Year	Typhoid fever death rate per 100,000 of population						
	Lawrence, Mass.	Lowell, Mass.	Newark, N. J.	Jersey City, N. J.	Paterson, N. J.	Albany, N. Y.	Binghamton, N. Y.
1880	69.0	37.0	52.7	25.7	(a)	(a)	(a)
1881	125.3	89.4	35.5	62.1	(a)	(a)	(a)
1882	79.4	81.5	67.8	116.6	(a)	(a)	(a)
1883	71.8	78.7	60.8	46.3	(a)	(a)	(a)
1884	48.8	64.9	58.1	78.9	(a)	(a)	(a)
1885	43.7	76.4	61.4	65.1	(a)	(a)	(a)
1886	57.5	74.8	53.5	56.6	(a)	(a)	(a)
1887	114.1	129.4	51.1	51.5	(a)	(a)	(a)
1888	113.4	85.8	44.6	71.6	(a)	(a)	(a)
1889	126.5	92.0	74.4	81.9	(a)	(a)	(a)
1890	134.4	160.9	106.7	97.5	5.1	65.3	60.0

[a] Figures not furnished.

Table showing effect of change of water supply on typhoid fever death rate—Continued

Year	Typhoid fever death rate per 100,000 of population						
	Lawrence, Mass.	Lowell, Mass.	Newark, N. J.	Jersey City, N. J.	Paterson, N. J.	Albany, N. Y.	Binghamton, N. Y.
1891	119.2	98.7	71.0	100.0	20.7	113.8	90.2
1892	104.9	95.8	[a] 78.3	72.0	17.5	52.7	50.1
1893	[b] 79.3	67.3	31.2	66.4	39.0	61.1	44.0
1894	49.3	[c] 61.4	20.6	53.7	7.5	54.8	48.8
1895	34.5	[c] 39.1	19.9	95.2	24.7	170.7	34.8
1896	25.8	43.9	27.5	[a] 84.3	43.5	102.2	23.8
1897	24.9	19.2	19.3	19.8	48.8	88.5	34.0
1898	24.0	27.6	13.2	40.1	37.2	99.0	72.3
1899	34.7	19.4	35.4	19.3	56.9	[b] 86.4	25.5
1900	19.2	17.9	21.1	22.8	26.6	41.4	40.4
1901	18.7	20.0	23.8	16.1	23.5	21.1	52.1
1902	19.8	17.9	19.6	20.3	[a] 34.4	32.4	[a] 29.2
1903	28.3	32.7	22.9	14.9	22.0	19.7	12.0
1904	17.5	20.0	13.6	18.9	7.3	17.5	9.4
1905	22.8	19.0	14.1	19.8	14.3	19.4	16.2
1906	21.0	7.4	17.6	20.2	4.4	20.3	11.4
Average:							
1880–1891			62.9				
1880–1892	94.0						
1880–1893		89.2					
1880–1895				71.9			
1890–1898						89.5	
1890–1901					30.4		47.9
1893–1906			21.3				
1894–1906	25.9						
1896–1906		22.6					
1897–1906				21.0			
1900–1906						24.9	
1903–1906					11.7		
Per cent of reduction	72.4	74.7	66.1	70.8	61.5	72.2	75.6

[a] To conserved river supply. [b] To filtration. [c] To wells.

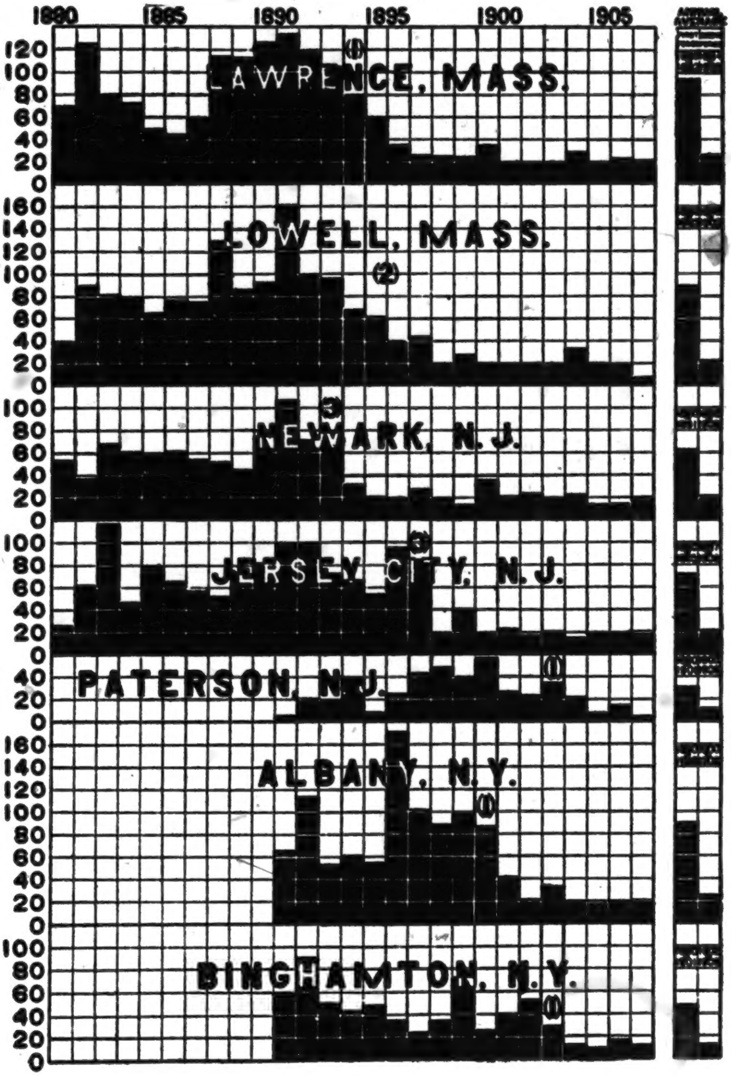
The Bulletin for the month of April, 1908, of the New York State Department of Health contains an interesting article showing that the death rate from typhoid fever in ten cities of that State has been reduced 53.4% by an improved water supply. The details are shown in the accompanying table:

Table showing the average typhoid death rate per 100,000 for a period prior to the improvement in the water supply, the average typhoid death rate per 100,000 since the change in the water supply, and the percentage of reduction caused by the improvement

	Place	Average before improvement	Average after improvement	Per cent reduction in death rate
1	Albany	88.8	23.7	73.0
2	Binghamton	39.3	11.7	72.2
3	Elmira	54.9	41.5	24.4
4	Hornell	42.2	24.7	41.4
5	Hudson	64.3	31.9	50.5
6	Ithaca	67.2	14.6	78.3
7	Rensselaer	95.5	54.4	43.0
8	Schenectady	25.0	14.4	42.6
9	Troy	58.2	31.0	46.8
10	Watertown	94.7	36.9	61.8

TYPHOID FEVER

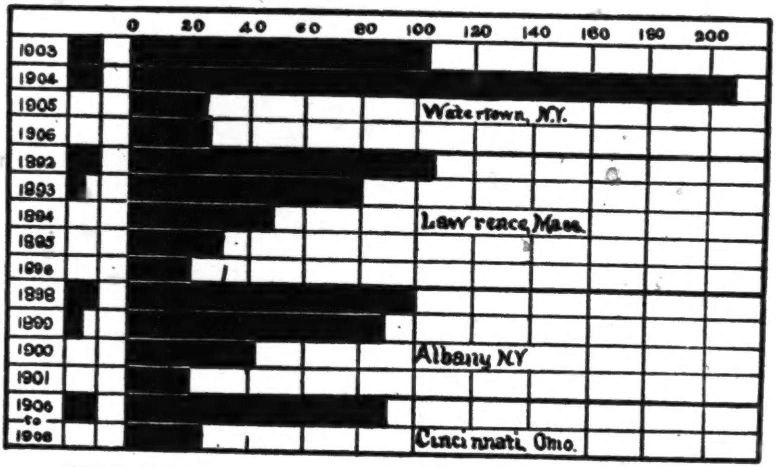
DEATH RATES PER 100,000 OF POPULATION



CHANGE IN WATER SUPPLY

(1) From unfiltered river supply to filtered river supply
(2) From unfiltered river supply to wells
(3) From polluted river supply to conserved river supply

It may be urged that improved methods of medical treatment are responsible for a considerable reduction in the death rates from typhoid fever, but when we see such a striking change immediately after the installation of filtration plants as in the case of the American cities shown in the accompanying diagram, we are forced to the conclusion that water purification plays the most important rôle. The rates in this chart are per 100,000 of population, except in the case of the city of Cincinnati where a comparison is made in the number of deaths since the introduction of filtered water, for November and December, 1907, January, February, and March, 1908, and the corresponding months for 1905, 1906, and 1907. For details see weekly reports of the Board of Health of Cincinnati, March 20, 1908.



ABRUPT REDUCTION IN DEATH RATES FROM TYPHOID FEVER INCIDENT TO WATER PURIFICATION IN FIVE AMERICAN CITIES.

The next table with the diagram on page 252 brings out the general movement of typhoid fever in different countries and cities showing percentage of decrease from first to last period shown. The period covered by Dr Wilbur is (as nearly as convenient) the last quarter of a century, and the rates are usually given for successive five-year periods, beginning with 1881. The table shows that during the last 25 years the death rate from typhoid fever has fallen in those 14 countries and cities from an average of 42.3 to 18.1 per 100,000, a reduction of 54.3%. A more striking reduction could have been shown, if statistics going back as far as 1870 had been included. The typhoid rate in Berlin in 1872, at a time when that city was riddled with cesspools and supplied with polluted water, was as high as 142 per 100,000. On account of the incomplete mortality returns everywhere prior to 1881, we have deemed it best to exclude all older foreign statistics, and for similar reasons Dr Wilbur begins his statistics for the United States with 1890.[a] We have likewise excluded Mr Whipple's statistics, which tend to show that the death rate from typhoid fever in 12 States, including all of the New England States, New York, New Jersey, Maryland, California, Minnesota and Michigan, has fallen from 55 in 1880 to 21 per 100,000 in 1905.

Table showing general movement of typhoid fever in different countries and cities, showing percentage of decrease from first to last period shown

Area	Death rate per 100,000 of population	Per cent of decrease from first period shown
Registration area United States:		
1890	46.3	
1901–1905	32.2	30.5
New South Wales:		
1881–1885	50.6	
1886–1890	44.5	
1891–1895	23.9	
1896–1900	30.0	
1901–1905	21.5	57.5
England and Wales:		
1881–1885	21.6	
1886–1890	17.9	
1891–1895	17.3	
1896–1900	17.5	
1901–1905	11.2	48.1
Norway:		
1881–1885	11.0	
1886–1890	9.0	
1891–1895	7.1	
1896–1900	7.4	
1901–1905	5.3	51.8
Belgium:		
1881–1885	56.4	
1886–1890	39.7	
1881–1895	34.4	
1896–1900	24.3	
1901–1905	16.8	70.2
Switzerland:		
1881–1885	29.3	
1886–1890	16.0	
1891–1895	11.1	
1896–1900	8.3	
1901–1905	6.2	78.8
Japan:		
1881–1885	15.0	
1886–1890	25.2	
1891–1895	20.6	
1896–1900	15.1	
1901–1905	11.6	22.7
Paris:		
1881–1885	88.0	
1886–1890	41.0	
1891–1895	22.0	
1896–1900	19.0	
1901–1905	12.0	86.4
Berlin:		
1881–1885	26.0	
1886–1890	14.0	
1891–1895	8.0	
1896–1900	5.0	
1901–1905	5.0	80.8
London:		
1871–1880	24.4	
1881–1890	18.9	
1891–1900	14.3	41.4
New York (old city):		
1873–1882	32.8	
1883–1892	28.7	
1893–1902	17.8	45.7
Chicago:		
1881–1885	65.7	
1886–1890	55.1	
1891–1895	80.7	
1896–1900	33.0	
1901–1905	27.7	57.8
Boston:		
1881–1885	51.9	
1886–1890	39.0	
1891–1895	29.6	
1896–1900	30.0	
1901–1905	22.4	56.8
Philadelphia:		
1881–1885	69.3	
1886–1890	68.0	
1891–1895	43.2	
1896–1900	45.6	
1901–1905	49.9	28.0

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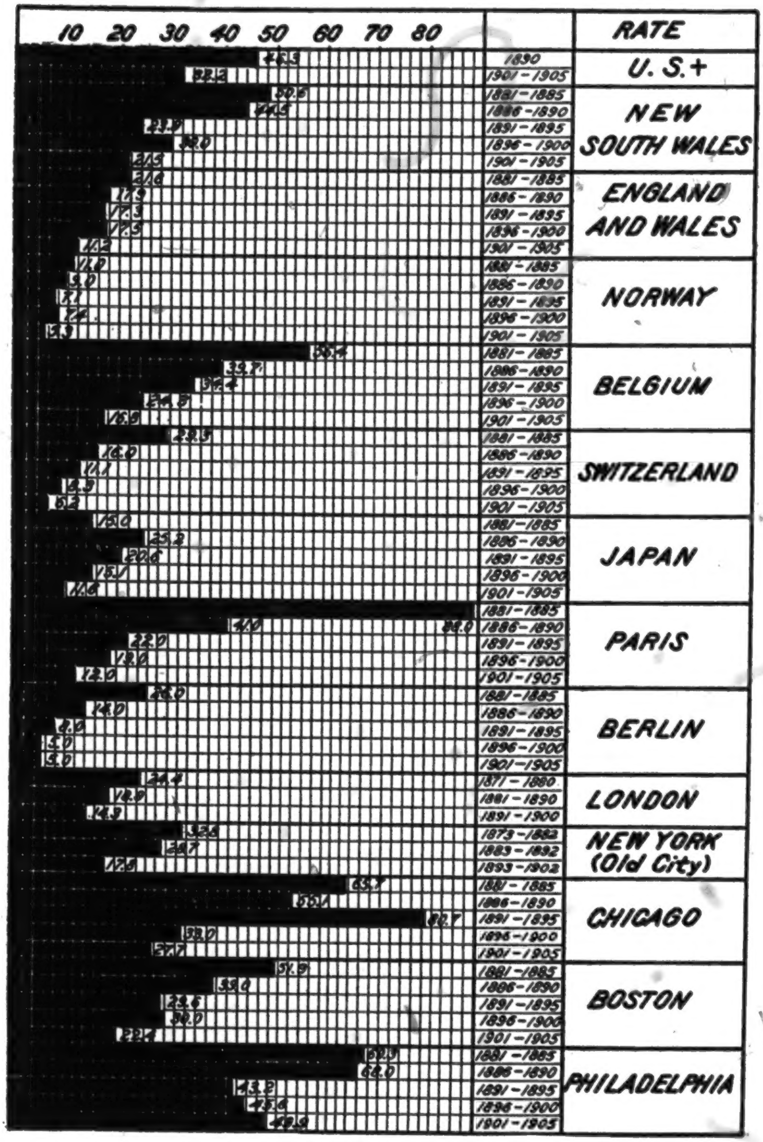
[a] Dr Wilbur obtained the foreign statistics from data compiled from the International figures given in the last report of the Registrar General of England and Wales, from which report the rates for London are also taken. The rates for the cities of Paris and Berlin are given in the *Annuaire Statistique* of the city of Paris for the year 1904, and the rate of Berlin for the period 1901–1905 was supplied by Dr Wilbur from data in his office. Dr Wilbur laments the fact that "it is even now difficult to obtain a satisfactory statement of the number of deaths from such an important disease as typhoid fever in certain foreign countries and the difficulty of securing comparative data increases as we go back. The disease was first accurately compiled by the Registrar General of England in 1869."

TYPHOID FEVER

DEATH RATE PER 100,000 OF POPULATION



+Registration area

The incomplete and unsatisfactory character of the mortality statistics in the United States is largely due to the limited extent of the registration area. The importance of vital statistics, which constitute the foundation stone of public hygiene, is not fully recognized by our States, and yet as remarked by Dr Billings "when we wish to study the healthfulness of a city, whether it is getting better or worse, or judge correctly the effect of certain sanitary laws, we should not only know the number of deaths, but also the amount and character of the prevalent diseases, together with accurate information as to the number of population at different ages."

OTHER WATER-BORNE DISEASES

What has been said of typhoid fever is equally true of other water-borne diseases like cholera, dysentery, cholera morbus, diarrheal diseases and the transmission of the eggs of intestinal and other parasites, because the germs or eggs of these diseases are present in the intestinal tract and presumably also in sewage contaminated water. Thus, for example, the cholera epidemic of Hamburg in August, 1892, resulting in 17,020 cases, with 8,605 deaths, was caused by a band of gypsies camped on the banks of the river Elbe, and the discharges of one of its members suffering from cholera were emptied into the river which at that time was served to the inhabitants of Hamburg without filtration. The epidemic spared the adjoining city of Altona, which derives its water from the same river after receiving the sewage of Hamburg with its 800,000 people, but Altona filtered its water and Hamburg at that time did not.

EFFECTS OF PURE WATER ON GENERAL DEATH RATES

We have already pointed out what the purification of Potomac water has accomplished in the way of reducing the mortality from typhoid, malarial and diarrhœal diseases. Mr Allen Hazen,[a] one of the most distinguished experts on water purification in America, has conclusively shown that as a result of the installation of filtration plants in five cities supplied previously with an impure water, there was not only a reduction

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[a] See paper read at the International Engineers' Congress at St. Louis in 1904. Mr Hazen found in five cities where the water supply had been radically improved—

	Per 100,000.
A reduction in total death rate with the introduction of a pure water supply	440
Normal reduction due to general improved sanitary conditions, computed from average of cities similarly situated, but with no radical change in water supply	137
Difference being decrease in death rate attributable to change in water supply	303
Of this, the reduction in deaths from typhoid fever was	71
Leaving deaths from other causes attributable to change in water supply	232

of 81% in the deaths from typhoid fever, but also a marked reduction in the general death rate. His computations clearly indicate that where one death from typhoid fever has been avoided by the use of a better water, a certain number of deaths, probably two or three, from other causes have been avoided. It is a difficult matter to explain how water is connected with the deaths other than those from water-borne diseases, yet when we consider that water enters into the composition of the human body to the extent of 63%, we are in a position to appreciate the sanitary acumen of Aristotle when he wrote in his Politica: "The greatest influence on health is exerted by those things which we most freely and frequently require for our existence, and this is especially true of water and air."

AVERAGE LENGTH OF HUMAN LIFE

Professor Finkelnburg, of Bonn, estimates that the average length of human life in the sixteenth century was only between 18 and 20 years, and that at the close of the eighteenth century it was a little over 30 years, while today it is between 38 and 40 years—indeed the span of life since 1880 has been lengthened about six years. No two factors have contributed so much to the general result as the improvement of the air we breathe and the water we drink. Indeed, we have ample evidence that with the introduction of public water supplies and sewers the general mortality in numerous cities during the past fifty years has been reduced fully one-half, the good effects being especially shown by a marked decrease in the number of cases of typhoid fever, diarrhœal diseases, and consumption. The vital statistics of Great Britain furnish the proof,[a] and our experience with American cities confirms this conclusion.

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[a] The following table shows the death rate from certain diseases per 10,000 of population in English cities before and after the introduction of sanitary works (see Cameron, A Manual of Hygiene, 1874, p. 129):

		Typhoid fever.	Diarrhœa.	Consumption.
Bristol	Before sanitary works	10.0	10.5	31.0
Do.	After sanitary works	6.5	9.1	25.5
Leicester	Before sanitary works	14.7	16.0	43.3
Do.	After sanitary works	7.7	19.3	29.3
Cardiff	Before sanitary works	17.5	17.2	34.7
Do.	After sanitary works	10.5	4.5	28.6
Macclesfield	Before sanitary works	14.2	11.0	51.5
Do.	After sanitary works	8.5	9.0	35.3
Warwick	Before sanitary works	19.0	5.7	40.0
Do.	After sanitary works	9.0	8.0	32.3
Stratford	Before sanitary works	12.5	11.2	26.6
Do.	After sanitary works	4.0	5.7	26.5
Ashby	Before sanitary works	13.3	4.0	25.5
Do.	After sanitary works	5.7	8.3	31.3
Dover	Before sanitary works	14.0	9.5	26.5
Do.	After sanitary works	9.0	7.0	21.2
Croydon	Before sanitary works	15.0	10.0	....
Do.	After sanitary works	5.5	7.0	....

EFFECTS OF PURE WATER ON THE NATURAL GROWTH OF THE POPULATION

The mortality of London between 1660 and 1679 was 50 per 1,000 of inhabitants; from 1680 to 1728, including the period of pests, it was 80 per 1,000; between 1729 and 1780 it was still 40 per 1,000, since which time it has steadily decreased to 15.1 per 1,000 in 1905.

The death rate in the city of Berlin has been reduced from 32.9 in 1875 to 16.4 in 1904; in Munich from 41.6 in 1871 to 18 in 1906, and in Washington from 28.08 in 1875 to 19.25 in 1907.

The death rate in the city of New York in 1804 was 28 per 1,000; from 1850 to 1854 it was 38 per 1,000; while in 1906, in spite of the density of population, it was 18.9 per 1,000, practically a reduction of 50%, which according to Walter F. Wilcox[a] of Cornell University, means a saving of something like 46,000 lives each year in that city alone.

The mortality in the registration area in the United States has been reduced since 1890 from 19.6 to 16.2 per 1,000 in 1905. Taking the Census figures of a population of 33,757,811 in the registration area as a basis, the number of deaths in 1905 was 544,533; whereas at a rate prevalent in 1890, they would have been 662,654; a reduction of 17.8% and a saving in one year of 118,121 lives. If the same ratio is applied to the entire estimated population in the United States of 82,574,195 the saving of human lives during 1905 alone would be over 290,000.

SELF-PURIFICATION OF STREAMS UNRELIABLE

We would not think of establishing a vicious circle between our mouths and the drainage of our houses and stables, and yet practically we have suffered this to be done upon the assumption that rivers purify themselves. A certain degree of purification is possible by natural means, such as dilution with unpolluted water, deposition of suspended matter, the agency of aquatic animals and plants, the bacteria of nitrification, the destructive influence of sunlight upon germ life, and the chemical affinity of certain bodies. These factors are calculated to purify waters, provided we give them a chance. This may still be true in very sparsely populated regions of our own country, but with increasing settlements the pollution of our streams will become continuous from their sources to their mouths, and river water to which sewage gains access must be considered as dangerous for drinking purposes.

ACTION REQUIRED IN THE INTEREST OF PUBLIC HEALTH

One of the most pressing needs is an investigation into the pollution of water supplies when such pollution affects or threatens to affect the sanitary condition of the people of more than one State, because the individual States are powerless to protect themselves against the misdeeds of their neighbors. Mr Bartholdt's bill for the appointment of a river pollution commission, first introduced in 1896, has not yet become a law. England enjoyed the benefit of such a commission as early as 1855, and in order to prevent, remedy, and remove the danger of polluted water supplies adopted a comprehensive system for the disposal of sewage and of water purification, the fruits of which have already been referred to.

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[a] Monthly Bulletin New York State Department of Health, March, 1908.

Sanitarians have maintained for years that no community or individual has a right to pollute streams used for public water supplies any more than a man has to poison his neighbor's well. The legal aspects of water pollution were presented by Dr J. L. Leal[a] in a paper read before the American Public Health Association, 1901, and it is gratifying to note that quite a number of our States and Territories, though in various degrees of effectiveness, have sought to protect waters used for public supplies within their boundaries. While much commendable progress has been made, more remains to be done, especially as regards uniformity of legislation and adequate protection of interstate waters. All that is needed in this country is a correct appreciation of the dangers of interstate water pollution.

The principles of common law as to waters have been appreciated by some of the nations of Europe. Thus the inhabitants of a town in Belgium suffered from the effects of a river polluted by the French, and the French government not only compelled the offending city to dispose of its sewage by irrigation but granted a subsidy for this purpose.

METHODS OF SEWAGE DISPOSAL

After determining the extent and dangers of river pollution, the remedy can and should be applied. This remedy is not only of interest to the sanitarian but also the agriculturist and consists in the adoption of a proper method of sewage disposal, including harmful industrial wastes.

The best method so far proposed is sewage farming, or irrigation. The British Royal Commission as early as 1876 approved it; in fact this method has been successfully used for centuries on the hot plains of northern Italy and in Spain, and will also have a very promising future in the West where every drop of water is needed for irrigation.

The city of Berlin purchased about 20,000 acres of land and, notwithstanding the enormous outlay of a little over $3,000,000 for the land and over $16,000,000 for the sewer system, operates these farms at a net profit of about $60,000 per annum. The city employs men condemned to the workhouse as laborers at the farms, and practically converts vagabonds into a producing class, with a fair prospect that many of these individuals will continue their honest efforts to become self-supporting citizens. Moreover the old manor-houses of the individual farms are utilized as country homes for convalescents, and thus the beneficent effects of this system are felt in more than one direction.

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[a] Dr Leal in his paper divided the States and Territories into five classes according to the nature of their statute law upon water pollution. Extracts of a more recent review by Edwin B. Goodell, which brings the subject matter up to August, 1905, is appended (pages 260–263). For complete digest consult Water Supply and Irrigation, Paper No. 152, U. S. Geological Survey, 1905.

Heretofore it has not been considered necessary to prevent the pollution of rivers affected by tide waters. Dr Conn of the Wesleyan University, in 1894, however, traced an outbreak of typhoid fever to raw oysters which had been fattened in a place where they were liable to contamination by typhoid-infected sewage, and since then numerous instances have been reported elsewhere. It has been shown that typhoid fever germs remain viable in oysters from fourteen to thirty days, and the medical officer of the local government of England in the twenty-fourth annual report points out the danger of many of the oyster beds from the sewage pollution on the English coast, all of which indicates that even this newly discovered source of danger must be guarded against.

On the whole we may conclude that sewage farming for economic reasons should be recommended for all localities where the grade will admit of the sewage being carried to lower lands. In sections of our country not adapted to farming and where land is scarce and expensive, purification of sewage by intermittent filtration should be adopted; in communities where land is so scarce that even intermittent filtration is impracticable, chemical precipitation or sedimentation; the bacterial or septic tank with Dilden's bacteria filters should also be considered. Space will not permit details concerning the different methods.

It is a matter of great satisfaction to know that within the past 15 years over one hundred communities in the United States have established plants for the disposal of sewage. In 1901 I published a tabulated list of 93 communities. In 1904 Mr Geo. W. Fuller[a] published a list of 114 towns and cities of over 3,000 population, which is appended (pages 264–271). A summary of types of sewage purification follows:

	Number of plants.	Estimated population
Irrigation	14	200,000
Intermittent sand filtration	41	250,000
Chemical precipitation	8	320,000
Chemical treatment by Power's Patent	5	125,000
Sedimentation (including grit chambers and receiving basins)	3	8,000
Strainers or roughing filters	4	20,000
Coarse grained filters at high rates	10	95,000
Septic treatment	29	160,000
	114	------------

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[a] See Sewage Disposal in America. Transaction Society of Civil Engineers. International Engineers' Congress, 1904, Paper 64.

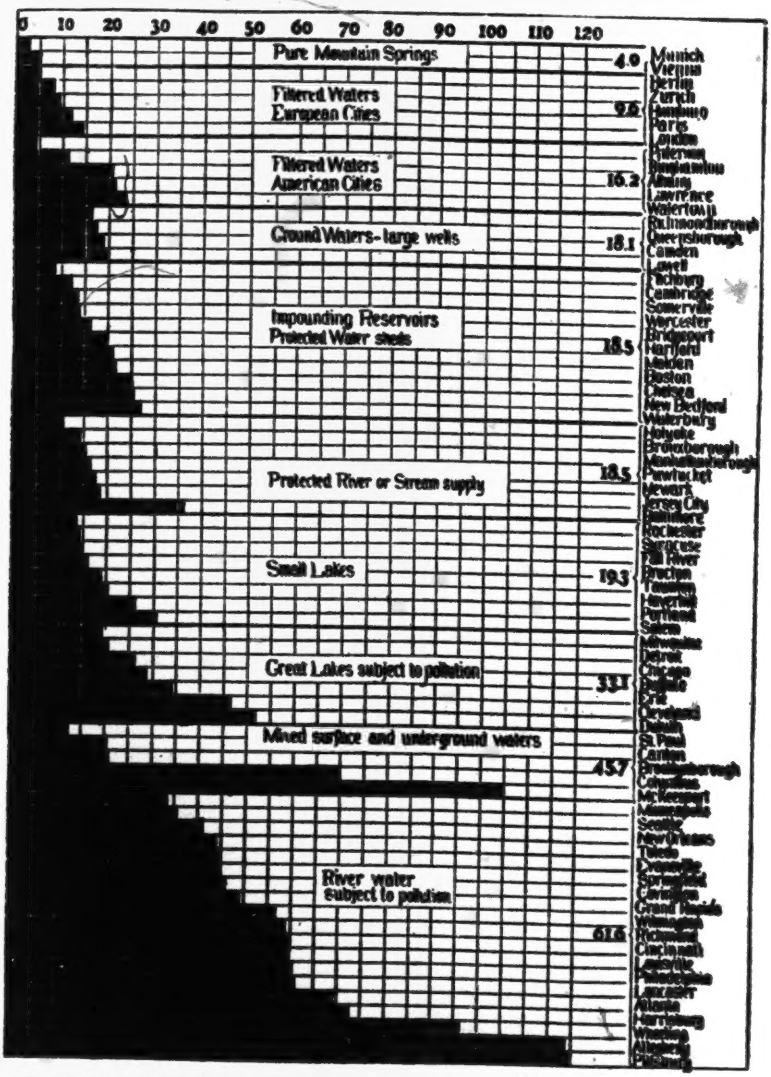
The first attempt in the establishment of a sewage farm in this country was made at the Augusta (Me.) State Insane Asylum in 1872. Among the more prominent and successful sewage farms may be mentioned Brockton and South Framingham, Mass.; Bristol, Conn.; Plainfield, N. J.; Altoona and Wayne, Pa.; Pullman, Ill.; Hastings, Nebr.; Colorado Springs, Colo.; Salt Lake City, Utah; Helena, Mont.; Phœnix, Ariz.; Fresno, Los Angeles, Pasadena, Redding, and Santa Rosa, Cal.

PURIFICATION OF PUBLIC WATER SUPPLIES—RESULTS ACHIEVED

The primary object of sewage disposal is the prevention of water-borne diseases, although the economic aspect should not be lost sight of, especially since it has been shown that this method alone can not be relied upon, as instanced by the cholera epidemic at Hamburg and the typhoid fever epidemics at Cumberland, Plymouth, and elsewhere, where the dejecta of a single patient were sufficient to cause the mischief; hence prevention of river pollution must be supplemented by filtration of the water supply on a large scale.

The diagram on page 259 shows the relation between typhoid death rates and various water supplies, grouped according to the character of their source, and shows conclusively that the European cities who not only prevent pollution of rivers but also filter their water enjoy the lowest typhoid fever rates.

In conclusion permit me to say that while we have reason to be proud of manifold achievements, we have not kept pace with other countries in matters relating to public health. I am profoundly grateful for the opportunity of discussing a subject of vital importance to the strength of this Nation. Progress has crowned our past. Let our conduct raise no blush on the cheek of posterity. Let us hand in hand, with heart and tongue, join in promoting the welfare of the American Nation by the conservation of health and life and all of our natural and wonderful resources.



MEAN DEATH RATES FROM TYPHOID FEVER, 1902 TO 1906, IN 66 AMERICAN CITIES AND 7 FOREIGN CITIES. GROUPED, AFTER FUERTES, ACCORDING TO THE QUALITY OF THEIR DRINKING WATER. THE RATES FOR FOREIGN CITIES ARE TAKEN FROM JAMES H. FUERTES.

APPENDIX

EXTRACTS FROM A REVIEW OF THE LAWS FORBIDDING POLLUTION OF INLAND WATERS IN THE UNITED STATES, BY EDWIN B. GOODELL

* * * * * * *

STATUTORY RESTRICTIONS OF WATER POLLUTION

Classification

Speaking generally, jurisdiction over the pollution of waters in the United States is confined to the several States. There is no provision in the Constitution which gives to Congress authority in the premises, partly, no doubt, because at the time of its adoption the great importance of the subject from an interstate point of view was not thought of. Hence, by the familiar principle that the several States retain full sovereign powers except so far as such powers are restricted by the National Constitution or expressly delegated thereby to the National Government, the States have full control of this subject. In reviewing these laws, accordingly, we must examine the statutes of all the States and Territories.

Uniformity of legislation is not to be expected. The natural conditions existing in different portions of the vast territory are so various, the density of population differs so widely in the different sections involved, and public enlightenment as to the deleterious effects of water pollution and the necessity to restrain it is, in sparsely settled districts, so far behind that which has been developed in congested areas by the terrible consequences, that statutory regulations must necessarily differ. In some States there is found nothing more than a simple provision making it a crime to poison wells and springs, while others have made elaborate provisions designed to check and, so far as possible, absolutely to prevent all pollution of waters by mingling with them the refuse products of animal life or the wastes of human industry. If, therefore, we are to avoid making this review a mere catalogue of statutes, it will be necessary to adopt some system of classification and grouping. Doubtless a mere citation of the statutes of all the States, taken in their alphabetical order, would serve a useful purpose in enabling the reader to turn to the particular section in which his interest lies and to find the legislation which affects this section. But if, by a logical grouping of States according to their progress in this particular, we can give a clearer idea of the status of such legislation as a whole, without seriously interfering with the usefulness of the book as a compendium of State laws upon this subject, much will be gained.

Accordingly, I have arranged the States and Territories in three groups or classes, placing those in each group in alphabetical order for convenience of reference.

Class I. States with partial restrictions

This group comprises those States and Territories in which the legislature has confined itself to forbidding the poisoning or pollution of drinking water in certain ways or in certain localities. They belong in the same category because they are all at the same stage of growth in sanitary education—i. e., there is manifest in their legislation no sense of the general desirability of pure natural waters, but only a desire to prevent certain acts recognized as criminal in intent or as likely to injure special groups of persons (public or private corporations), whom the legislature desires to protect

To this class belong Alabama, Arkansas, Delaware, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Louisiana, Michigan, Mississippi, Nebraska, North Dakota, Oklahoma, Rhode Island, Wisconsin. * * *

Class II. States with general restrictions

This group consists of those States and Territories in which the importance of pure water for every inhabitant of the State or Territory for drinking and domestic purposes has received legislative recognition. It will be noted that the laws are general in their application, varying much in the elaborateness of the wording and in the emphasis laid upon the remedies and penalties provided for infractions of the law.

This class logically includes all States not included in Class I, but inasmuch as certain States have recently adopted stringent and elaborate methods, novel and extraordinary in their character, to restore and protect the purity of their navigable and potable waters, these States have been omitted from Class II and are treated in a class by themselves, forming Class III. The following States are grouped under Class II: California, Colorado, Illinois, Indiana, Maine, Maryland, Missouri, Nevada, New Mexico, North Carolina, Ohio, Oregon, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wyoming. * * *

Class III. States with severe restrictions

This group consists of those States which have adopted unusual and stringent methods to enforce the right of their citizens to unpolluted natural waters. The adoption of the legislation embodied in the following pages under this group indicates that the inhabitants of the States in which these laws have been adopted have begun to realize the immense harm which the increased pollution of waters, owing to increase of population, is doing to persons and property within their borders. It is noticeable that in several of the States stringent methods are adopted by which pollution by cities can be regulated and controlled; while in at least one State (New Jersey) a system has been instituted which, carried to its logical conclusion, will result in conveying all sewage matter from cities and large towns so far beyond the borders of the land as to render it wholly inoffensive or in some other way preventing its getting into any inland waters in an offensive form. The following States are grouped under Class III: Connecticut, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Vermont. * * *

General Rules

The foregoing compendium of common and statute law may be summarized and stated in a few general rules, which will perhaps be useful to property owners and also to officers charged with the duty of protecting health and property rights in waters.

In the nature of the case these rules can be only general, and many exigencies will appear in which more particular instructions must be obtained from the consultation of text-books and decisions or from the advice of counsel.

I. Rights and duties of riparian owners

Every riparian owner has the right—

1. To use the waters of streams, navigable or otherwise, which flow across or along his property for the ordinary purposes incidental to domestic life and agriculture, including grazing.

2. To use such waters for water power and for all kinds of manufacturing purposes which do not sensibly diminish the quantity which flows on for the use of lower proprietors nor change the quality of the waters to any appreciable extent, nor interfere with the use of the stream, if navigable by the public.

3. To have such waters flow to him from the premises of higher proprietors not unreasonably diminished nor diverted nor rendered impure by the farming or domestic uses to which the waters are subjected by higher proprietors.

4. To have such waters flow to him not sensibly changed in quality by any manufacturing or other uses to which they may have been put by higher proprietors.

5. To have such waters to flow to him in their natural bed, unpolluted by any deposits of filth or any other substance in the bed or channel previously traversed by them. But 3, 4, and 5 do not apply to riparian owners in those States in which the doctrine of prior appropriation is the law.

Conversely, it is the duty of every riparian owner—

1. To so guard his use of the waters of streams which flow across or along his property for domestic and agricultural purposes as not unreasonably to divert nor diminish nor render impure such waters.

2. To refrain from every use in manufacturing which will divert or sensibly diminish the quantity of the waters which flow onward to the lower proprietors or render them appreciably different in quality.

3. To refrain from depositing any filth or other substances in the bed of such streams in such a manner or to such an extent as will cause the waters to flow to the lower proprietors out of their natural bed or will in anywise pollute them or render them impure.

Where the doctrine of prior appropriation is in force the appropriator must confine his use of the appropriated water to the use for which he has appropriated it and take only so much as is reasonably necessary to accomplish that purpose. He may not pollute the stream wantonly, nor by using it for purposes not included in his appropriation. Subject to these restrictions, the prior appropriator has the right to divert from the stream and use as much of the water as is necessary to accomplish the purpose for which it was appropriated.

II. Rights and duties of municipal corporations

Considered as corporate entities, municipal corporations have such rights and powers only as are conferred upon them by statute, either expressly or by necessary implication.

When under due authority they become the owners of lakes, reservoirs, and natural streams, they have the same rights to pure water and are charged with the same duties as are other riparian proprietors.

If authorized to construct a system of sewers draining into a stream, such authority does not exempt them (except in the State of Indiana) from the duty not to pollute the stream to the damage of lower proprietors.

The rights of property owners, specified in 3, 4, and 5 above are property rights and can not be taken away from owners for public use except upon payment therefor of an amount determined by constitutional condemnation proceedings authorized by statute.

Therefore, until municipal corporations have, by such proceedings, acquired the rights of all lower proprietors and paid for them, they are required in all cases to refrain from the pollution of streams to the same extent as private owners.

III. Rights and duties of the public

By "the public" is meant that indefinite number of individuals, whether larger or smaller, who occupy as a common habitation a neighborhood, village, town, State, or country. Rights and duties which affect inhabitants of the neighborhood, village, town, State or country as a whole, or a considerable but indefinite number of them, are called "public" rights and duties.

The public, in this sense, aside from the right to use navigable waters for commerce, has the right to enjoy the natural waters and the air which passes over them, so far as life and health are affected by these elements, in a condition so near that in which nature left them that their use will not destroy nor injure health.

And, reciprocally, the public, and each member of it, is charged with the duty not to pollute the natural waters upon which the community depends for life and health in any manner that will render the continued use of the waters, or of the air which passes over them, destructive of or injurious to the life or health of the community.

Public rights and duties enforced by statute

The rights and duties attempted to be expressed under Class III have received some recognition by the courts apart from statutory enactments. They have been enforced chiefly, however, through legislation. These rights and duties have received full recognition, and an active effort has been made to provide an efficient sanction for their enforcement by the legislatures of all the States included in Class II and Class III, as hereinbefore stated. These classes include thirty-eight of the States and Territories.

These statutes, not being in derogation of common-law rights, have been construed as remedial statutes and not unconstitutional, although in some cases they may seem to interfere with prescriptive rights. No one can acquire by prescription a right to do an act which menaces public health or destroys public comfort.

Progress of legislation

It will have been noticed that public opinion, as expressed in public laws, is steadily progressing in the direction of a full, complete, and comprehensive enforcement of all the rights and duties of riparian owners, of municipal corporations, and of the public, as summarized above. Each advance in statutory regulation is an advance in that direction, and more especially in the direction of regulating and enforcing public rights and municipal rights and duties.

Private owners, from time immemorial, have been active in protecting their riparian rights as against other private owners. But the effect of pollution upon public health has not, until a comparatively recent period, been brought prominently into notice. The pollution of streams by cities and private persons has, accordingly, not received the attention which it deserves. This state of affairs is now rapidly passing away. Courts have shown themselves fully alive to the existence and validity of public rights in this respect, and the legislatures in Class III, comprising the States of Connecticut, Massachusetts, New Hampshire, New York, New Jersey, Minnesota, Vermont, and Pennsylvania, which has come into this class by legislation enacted in 1905, have made enactments calculated so to control such pollution as eventually to prevent all danger to public health.

List of cities and towns of over 3,000 population in the United States where, according to available data, sewage purification works are or have been in operation during the ten years 1894–1904, with memoranda indicating roughly size and character of each plant

Date of installation of plant	Place	Population		Average daily sewage flow in gallons estimated	Tanks or basins		Filtration	
		Total in 1900	Connected to sewers in 1904, estimated		Kind [a]	Total capacity in gallons	Kind [b]	Total area in acres
1887	Coney Island, N. Y	(?)	Very variable.	1,581,000	C. P	21,780	None	0
	do	(?)		680,000	C. P	21,780	None	0
1888	East Orange, N. J	21,506	0	0	C. P	225,000	Int.-irr	14.7
1888	Mystic Valley, Mass	(?)	0	0	C. P	(?)	None	0
1889	Framingham, Mass	11,302	7,500	652,000	R. B	431,000	Int	19.9
1890	Greeley, Colo	3,035	5,000	(?)	(?)	(?)	Irr	25
1890	Worcester, Mass	118,421	122,000	15,550,000	C. P	5,600,000	Int	23
1891	Gardner, Mass	10,813	3,500	302,000	S. B	10,500	Int	2.5
1891	Marlborough, Mass	13,609	10,000	1,100,000	S. B	16,000	Int	11.2
1892	Hastings, Nebr	13,854	(?)	(?)	(?)	(?)	Irr	15±
1892	Los Angeles, Cal	102,479	90,000	7,000,000	None	0	Irr	2,000
1892	Summit, N. J	5,302	(?)	(?)	None	0	Int	10
1892	Trinidad, Colo	5,345	(?)	(?)	S. B	7,500	Irr	(?)
1892	White Plains, N. Y	7,899	(?)	(?)	C. P	30,000	None	0
1892	Sheepshead Bay, N. Y	(?)	Variable.	1,976,000	C. P	18,400	None	0
1893	Canton, Ohio	30,667	11,000	2,000,000	C. P	700,000	None	0
1893	Chautauqua, N. Y	(?)	Variable.	(?)	C. P	(?)	None	0
1893	Meriden, Conn	24,296	20,000	2,750,000	None	0	Int	11
1893	North Brookfield, Mass	4,587	1,000	60,000	S. B	6,000	Irr	20.5
1893	Pasadena, Cal	9,117	10,000	600,000	None	0	Irr	300
1893	Pawtucket, R. I	39,231	5,100	138,300	R. B	65,800	Int	3.4
1893	Westborough, Mass	5,400	3,000	282,000	S. B	675	Int	4
1894	Brockton, Mass	40,063	30,000	878,000	R. B	619,000	Int	21.5
1894	Oberlin, Ohio	4,082	3,000	200,000	S. B	6,750	Irr Int	1.25 3.5
1894	Princeton, N. J	3,899	(?)	(?)	(?)	(?)	Irr	(?)
1894	Urbana, Ill	5,728	(?)	(?)	Sep.	(?)	None	0
1895	Bristol, Conn	6,268	4,000	(?)	(?)	(?)	Int Irr	6 6
1895	Reading, Pa	78,961	(?)	2,000,000	(?)	(?)	Special	0.58
1896	Alliance, Ohio	8,974	4,000	500,000	C. P	420,000	None	0
1896	Central Falls, R. I	18,167	3,931	40,000	S. B	140,000	Int	1.03
1896	Leicester, Mass	3,166	500	35,000	S. B	2,400	Int Irr	0.36 (?)
1896	Natick, Mass	9,488	4,000	566,000	R. B	500,000	Int	11.1
1896	New Rochelle, N. Y	14,720	5,000	500,000	C. [illegible]	353,925	None	0
1896	Plainfield, N. J	15,369	0	0	None	0	Int	16
1896	Salt Lake City, Utah	53,531	22,000	5,000,000	None	0	Irr	150
1896	Santa Rosa, Cal	6,673	0	0	C. P	72,000	Irr	17
1897	Altoona, Pa	38,973	15,000	1,000,000	None	0	Irr	59

1897	Champaign, Ill	9,098	5,000	350,000	Sep	22,200	None	0
1897	Danbury, Conn	16,537	8,000	600,000	None	0	Irr Int	5 5
1897	East New York, N. Y	66,086	60,000	7,680,000	C. P	180,000	None	0
1897	Paris, Tex	9,358	2,500	15,000	S. B	7,500	Int	5.5
1897	Spencer, Mass	7,627	3,000	375,000	None	0	Int	9.3
1898	Bakersfield, Cal	4,836	5,000	350,000	None	0	Irr	100.0+
1898	Kewanee, Ill	8,382	8,000	2,000,000	Sep	450,000	None	0
1898	Ripon, Wis	3,818	1,200	(?)	(?)	(?)	Int	1
1899	Aiken, S. C	3,414	3,000	160,000	Dosing	20,000	Int	1
1899	Andover, Mass	6,813	3,600	125,000	S. B	13,500	Int	3.7
1899	Clinton, Mass	13,665	11,000	783,000	R. B	670,000	Int	23.6
1899	East Cleveland, Ohio	2,757	5,000	400,000	Sep	170,000	Waring	0.45
1899	Glenville, Ohio	5,588	(?)	400,000	C. P	160,000	Int Strainers	1.0 0.19
1899	Marion, Iowa	4,102	2,000	200,000	Sep	130,000	None	0
1899	Woonsocket, R. I	28,204	11,000	460,000	R. B	500,000	Int	2
1900	Concord, Mass	5,652	1,200	312,000	R. B	242,000	Int	3.3
1900	Fostoria, Ohio	7,730	3,500	400,000	R. B	450,000	Int Irr	6 14
1900	Holland, Mich	7,790	2,000	300,000	Sep	60,000	None	0
1900	Houston, Tex	44,633	15,000	1,000,000	None	0	Coke beds Int	12
1900	Independence, Mo	8,000	3,000	125,000	Sep	262,000	Int	0.3
1900	Manchester, Conn	10,601	6,000	1,500,000	None	0	Int	12
1900	Mendota, Ill	3,736	(?)	(?)	(?)	(?)	Int Irr	2.5 8.0
1900	Shelby, Ohio	4,865	1,500	250,000	S. B	1,250,000	Strainer	0.6
1900	Vineland, N. J	4,370	3,000	300,000	None	0	Int	5
1901	Danville, Ky	4,285	(?)	(?)	Sep	(?)	Subsurf Irr	(?)
1901	Depew, N. Y	3,379	3,000	100,000	Sep	95,000	Contact	0.105
1901	Fond du Lac, Wis	15,110	8,000	1,000,000	Sep	376,000	Contact	0.72
1901	Franklin, Mass	5,017	500	(?)	None	0	Int	1.5
1901	Gardner, Mass	10,813	4,500	250,000	S. B	168,000	Int Coke-str	2.25 0.55
1901	Kingston, N. Y	24,535	2 wards.	(?)	Sep	(?)	Contact	(?)
1901	Madison, Wis	19,164	15,000	1,000,000	Sep	400,000	Double contin. int.	1
1901	Pittsfield, Mass	21,766	15,000	1,456,000	R. B	1,500,000	Int	22
1901	Princeton, Ill	4,023	(?)	(?)	Sep	60,000	Int	3.8
1901	San Luis Obispo, Cal	3,021	3,000	350,000	Sep	52,000	Contact	0.1
1901	Southbridge, Mass	10,025	2,200	350,000	Dosing	14,200	Int	7.25
1902	Burlington, N. J	7,392	7,500	1,500,000	Sep	120,000	Irr	11
1902	Grinnell, Iowa	3,860	3,000	183,000	Sep	225,000	None	0
1902	La Grange, Ill	3,969	4,000	200,000	Sep	210,000	None	0
1902	Macomb, Ill	5,375	(?)	(?)	Sep	(?)	(?)	(?)
1902	Mansfield, Ohio	17,640	8,500	1,000,000	Sep	1,000,000	Contact	1.25
1902	Plainfield, N. J	15,369	9,000	800,000	Sep	450,000	Double contact.	1.79
1902	Providence, R. I	175,600	170,000	20,380,000	C. P	11,100,000	None	0

[a] C. P., chemical precipitation; R. B., receiving basin; S. B., settling basin or grit chamber; Sep., septic tank.
[b] Irr. irrigation; Int., intermittent filters.

List of cities and towns of over 3,000 population in the United States where, according to available data, sewage purification works are or have been in operation during the ten years 1894–1904, with memoranda indicating roughly size and character of each plant—Continued

Date of installation of plant	Place	Population		Average daily sewage flow in gallons, estimated	Tanks or basins		Filtration	
		Total in 1900	Connected to sewers in 1904, estimated		Kind	Total capacity in gallons	Kind	Total area in acres
1902	Red Bank N. J	5,428	(?)	160,000	Sep.	100,000	None	0
1902	Santa Rosa, Cal	6,673	3,500	750,000	Sep.	310,000	Irr	17
1902	Sherman, Tex	10,241	1,800	(?)	None	0	Int	8
1903	Monmouth, Ill	7,460	(?)	350,000	Sep.	400,000	None	0
1903	Muskogee, Ind. T	4,254	5,000	(?)	Sep.	50,000	(?)	0.5
1903	Pomona, Cal	5,625	4,000	200,000	Sep.	27,500	Irr	15
1903	Saratoga Springs, N. Y	12,409	10,000 40,000	1,800,000	Sep.	1,000,000	Int	21
1903	Visalia, Cal	3,085	4,000	240,000	S. B	30,000	Irr	70
1904 [a]	Bedford, Ind	6,115	4,000	(?)	Sep.	85,000	None	0
1904 [a]	Durham, N. C	6,679	8,000	400,000	Sep.	250,000	Contact	(?)
1904 [a]	Iola, Kans	5,791	8,000	500,000	Sep.	167,800	None	0
1904 [a]	New Britain, Conn	28,202	24,000	3,000,000	None	0	Int	31

[a] To June 1.

From Transactions of American Society of Civil Engineers—International Engineering Congress, 1904. Paper No. 64, "Sewage Disposal in America," by George W. Fuller, M. Am. Soc. C. E.—Vol. LIV, Part E, pp. 155–157.

Table showing water supply and death rates from typhoid fever in 120 American cities having a population of 30,000 or over

CLASS I—CITIES HAVING UNDERGROUND WATER SUPPLIES

City	Population, 1900	Source of supply	Method of artificial purification	Death rates from typhoid fever per 100,000 of population							
				1900	1901	1902	1903	1904	1905	1906	Mean rate, 1902 to 1906
Allentown, Pa	35.416	Spring-outlet of underground stream.	None	28.2	46.7	189.5	33.8	32.9	41.9	50.5	69.7
Camden, N. J	75.935	Wells	None	13.2	15.5	22.8	13.7	20.8	18.0	17.7	18.6
Dayton, Ohio	85.333	Wells, 30–60 feet deep	None	35.2	34.2	44.4	23.7	27.3	22.4	24.8	28.5
Des Moines, Iowa	62,139	Collecting galleries under Raccoon river.	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Dubuque, Iowa	36,297	Flowing wells	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Fort Wayne, Ind	45.115	Collecting wells in beds of rivers.	None	(b)	36.9	27.6	39.6	30.6	16.0	29.4	28.6
Galveston, Tex	37.789	Flowing wells	None	(a)	(a)	(a)	(a)	(a)	(a)	26.2	(c)
Houston, Tex	44,633	Flowing wells	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Lincoln, Nebr	40,169	Deep wells	None	9.9	36.2	39.7	15.8	22.0	23.5	18.7	23.9
Lowell, Mass	94,969	Wells since 1896	None	17.9	20.0	17.9	32.7	20.0	19.0	7.4	19.4
Memphis, Tenn	102,320	Deep wells	None	47.9	51.8	39.1	41.3	46.0	33.8	42.4	40.5
New York (Queen's borough).	152,999	Wells	None	24.2	17.9	21.1	16.1	19.6	17.7	14.5	17.8
New York (Richmond borough).	67.021	Wells	None	19.3	26.4	14.4	19.8	20.9	15.1	13.5	16.7
Newton, Mass	33.587	Collecting galleries under Charles river and wells.	None	26.8	17.5	5.7	8.4	8.3	10.8	13.3	9.3
Peoria, Ill	56,100	Wells, 20–40 feet deep	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Rockford, Ill	31,051	Wells	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
San Antonio, Tex	53.321	Flowing wells	None	46.9	61.9	65.5	62.0	50.4	44.2	28.7	50.2
Savannah, Ga	54,244	Flowing wells	None	40.6	28.9	44.1	54.1	78.8	40.1	40.8	51.6
South Bend, Ind	35,999	Flowing wells	None	(b)	29.4	28.3	14.9	16.8	27.8	17.9	21.1
Springfield, Ohio	38.253	Seepage galleries and wells	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Superior, Wis	31,091	Driven wells	None	115.8	49.7	33.1	49.5	33.8	30.1	93.0	47.9
Topeka, Kans	33,608	Wells	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)

CLASS II—CITIES HAVING RIVER-WATER SUPPLIES

City	Population, 1900	Source of supply	Method of artificial purification	1900	1901	1902	1903	1904	1905	1906	Mean rate, 1902 to 1906
Albany, N. Y	94,151	Hudson river	Slow sand filters installed in 1899	41.4	21.1	32.4	19.7	17.5	19.4	20.3	21.9
Allegheny, Pa	129,896	Infiltration crib in Allegheny river.	None; supply will come from Pittsburg filters.	93.9	75.0	121.6	102.9	123.2	126.7	136.3	122.1
Atlanta, Ga	89,872	Chattahoochee river	Mechanical filters	74.6	77.1	68.9	66.3	60.8	70.1	75.2	68.3
Augusta, Ga	39.441	Savannah river	(?)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)

[a] Nonregistration.

[b] Not separately reported.

[c] Not registration for entire period.

Table showing water supply and death rates from typhoid fever in 120 American cities having a population of 30,000 or over—Continued

CLASS II—CITIES HAVING RIVER-WATER SUPPLIES—Continued

City	Population, 1900	Source of supply	Method of artificial purification	Death rates from typhoid fever per 100,000 of population							
				1900	1901	1902	1903	1904	1905	1906	Mean rate, 1902 to 1906
Binghamton, N. Y.	39,647	North branch of Susquehanna river.	Mechanical filters.	40.4	52.1	29.2	12.0	9.4	16.2	11.4	15.6
Birmingham, Ala.	38,415	Cahaba river and Five-mile creek.	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Chester, Pa.	33,988	Delaware river	Sedimentation basins and mechanical filters.	(a)	(a)	(a)	(a)	(a)	(a)	65.8	(b)
Cincinnati, Ohio	325,902	Ohio river	Sedimentation basins and mechanical filters, using iron sulphate and caustic lime; installed November, 1907.	39.0	54.9	61.9	42.7	80.2	41.1	71.5	59.5
Covington, Ky.	42,938	Ohio river	Prolonged sedimentation.	44.2	27.6	36.3	35.7	39.7	45.8	49.5	41.4
Davenport, Iowa	35,254	Mississippi river	Sedimentation basins and mechanical filters.	53.9	33.2	29.7	31.6	33.4	15.1	(a)	(b)
Evansville, Ind.	59,007	Ohio river; installed 1900.	None	49.2	26.7	42.9	27.7	40.1	42.8	39.1	38.5
Grand Rapids, Mich	87,565	Grand river	Sand filters projected	30.8	33.5	51.3	41.6	61.6	49.1	39.1	48.5
Harrisburg, Pa.	50,167	Susquehanna river	Filters installed January, 1906	49.8	66.5	63.4	103.9	59.4	69.3	66.4	72.5
Kansas City, Kans	51,418	Missouri river	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Kansas City, Mo.	163,752	Missouri river	Sedimentation with coagulant	35.4	45.5	38.2	80.3	43.1	61.4	37.8	52.2
Knoxville, Tenn.	32,637	Tennessee river	Filters.	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Lancaster, Pa.	41,459	Conestoga river	Slow sand filters with coagulant used intermittently; installed April, 1906.	43.4	21.2	50.8	51.9	79.6	43.3	78.5	60.8
Lawrence, Mass.	62,559	Merrimac river	Slow sand filters installed September, 1893.	19.2	18.7	19.8	28.3	17.5	22.8	21.0	21.9
Little Rock, Ark.	38,307	Arkansas river	(?)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Louisville, Ky.	204,731	Ohio river	Mechanical filters under consideration.	64.0	46.0	60.3	59.8	61.6	49.4	67.7	59.8
Minneapolis, Minn	202,718	Mississippi river	None	41.4	58.7	26.9	41.1	40.4	24.4	32.9	33.1
New Orleans, La	287,104	Mississippi river	None	52.6	50.1	44.2	40.9	36.7	32.6	29.6	36.8
Omaha, Nebr	102,555	Missouri river	Sedimentation basins only	23.4	24.5	[illegible]	11.5	17.1	24.9	28.2	20.7
Paterson, N. J.	105,171	Passaic river	Mechanical filters installed 1902[a]	26.6	23.5	34.4	22.6	7.3	14.3	4.4	16.5
Philadelphia, Pa.	1,293,697	Schuylkill and Delaware rivers.	Slow sand filters under construction; Roxborough supply filters installed 1907.	37.2	34.6	47.3	72.6	55.0	51.1	74.8	60.2
Pittsburg, Pa.	321,616	Allegheny river	Slow sand filters (in operation?)	144.3	123.8	140.[illegible]	136.5	139.4	107.9	141.3	133.1
Providence, R. I.	175,597	Pawtuxet river	Slow sand filters installed November, 1905.	23.9	25.0	21.1	19.5	15.5	20.1	19.2	19.1
Quincy, Ill.	36,252	Mississippi river	Mechanical filters, using sulphate of iron and lime.	30.3	40.8	56.4	39.8	52.4	25.9	33.2	41.5
Richmond, Va.	85,050	James river	Sedimentation basins only	104.6	51.5	72.3	73.1	54.3	44.9	47.0	58.3
Saginaw, Mich.	42,345	Saginaw river	None; for fire protection only	28.3	27.6	9.0	11.0	49.3	25.2	24.6	23.8

St. Louis, Mo.	575,238	Mississippi river	Intake moved to Chain of Rocks 1894; sedimentation basins with lime and sulphate of iron coagulant installed 1894.	32.5	33.4	40.0	52.4	37.9	22.6	18.3	34.2
Seattle, Wash.	80,671	Cedar river	None	34.7	30.8	32.9	36.9	36.5	36.1	35.5	35.6
Springfield, Ill.	34,159	Sangamon river	None	35.1	25.8	31.0	49.7	40.0	36.6	41.1	39.7
Terre Haute, Ind.	36,673	Wabash river	Mechanical filters installed 1890	65.5	75.0	44.8	57.0	61.1	48.2	47.3	51.7
Toledo, Ohio	131,822	Maumee river	Mechanical filters under construction (installed in 1907?).	41.0	32.2	34.7	29.5	37.2	45.7	45.0	38.4
Trenton, N. J.	73,307	Delaware river	(?)	32.7	18.5	39.9	60.1	42.7	24.9	34.7	20.5
Washington, D. C.	278,718	Potomac river	Slow sand filters installed November, 1905.	79.7	61.4	79.1	48.8	47.0	48.2	52.3	55.1
Wheeling, W. Va.	38,878	Ohio river	None	59.1	86.5	95.6	97.0	78.8	85.2	125.3	96.4
Wilmington, Del.	76,508	Brandywine river	Filters under construction	52.3	41.2	60.7	94.7	50.9	35.8	45.8	57.6
York, Pa.	33,708	Codorus creek	None	(?)	(a)	(a)	(a)	(a)	(a)	17.9	(b)
Youngstown, Ohio	44,885	Mahoning river	Mechanical filters installed 1905	82.4	136.8	135.5	180.0	89.8	67.9	66.4	107.9

CLASS III—CITIES HAVING LAKE OR UPLAND CONSERVED WATER SUPPLIES

Altoona, Pa.	38,973	Mountain reservoir	None	41.6	32.6	24.5	40.7	60.9	68.0	68.9	52.6
Baltimore, Md.	508,957	Conserved streams	None	38.9	28.7	42.0	35.0	37.5	35.7	34.3	36.9
Boston, Mass.	560,892	Impounding reservoirs	None	24.1	23.8	22.1	20.5	23.6	20.8	21.6	21.7
Bridgeport, Conn.	70,996	Impounding reservoirs	None	19.7	26.0	23.9	14.2	17.5	13.4	11.9	16.2
Brockton, Mass.	40,063	Silver lake	None	49.9	14.4	13.9	11.2	19.5	18.8	18.2	16.3
Buffalo, N. Y.	352,387	Lake Erie	None	23.5	27.1	33.7	34.6	24.2	24.4	23.6	28.1
Butte, Mont.	30,470	Impounding reservoirs	(?)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Cambridge, Mass.	91,886	Impounding reservoirs and ponds.	None	17.4	8.6	10.6	10.5	15.6	12.3	11.1	12.0
Charleston, S. C.	55,807	Impounding reservoirs on Goose creek, installed 1904.	Mechanical filters, installed 1904	132.6	85.9	80.4	64.2	58.8	53.4	83.5	68.1
Chelsea, Mass.	34,072	Impounding reservoirs	None	20.5	28.8	31.1	13.9	32.7	24.1	21.1	24.6
Chicago, Ill.	1,698,575	Lake Michigan	None	21.1	29.8	45.1	32.1	20.2	16.5	18.3	26.4
Cleveland, Ohio	381,768	Lake Erie	None	56.8	34.9	35.5	115.0	49.6	14.9	20.2	47.0
Detroit, Mich.	285,704	Detroit river	None	28.4	30.1	23.5	20.0	17.6	21.2	22.3	20.9
Duluth, Minn.	52,969	Lake Superior	None	109.5	74.1	53.7	64.8	54.4	44.7	46.0	52.7
Elmira, N. Y.	35,672	Impounding reservoirs	Mechanical filters	44.8	28.0	36.4	86.8	53.2	28.0	47.6	50.4
Erie, Pa.	52,733	Presque Isle bay up to 1905.	Has intake been extended to Lake Erie?	37.9	16.7	25.4	33.7	48.6	17.0	48.3	34.6
Fall River, Mass.	104,863	Lake	None	27.7	25.7	11.4	22.8	18.9	11.3	7.6	14.4
Fitchburg, Mass.	31,531	Impounding reservoirs and pond.	None	31.7	22.0	12.5	3.1	9.2	12.1	3.0	8.0
Hartford, Conn.	79,850	Impounding reservoirs	None	52.6	43.6	16.4	21.6	13.3	17.2	31.3	20.0
Haverhill, Mass.	37,175	Lakes and impounding reservoirs.	None	16.1	24.1	26.7	13.3	13.3	21.1	26.3	20.1
Holyoke, Mass.	45,712	Conserved river and ponds.	None	30.6	15.0	16.9	10.4	8.1	8.0	9.8	10.6
Jersey City, N. J.	206,433	Conserved river supply	None	22.8	16.1	20.3	14.9	18.9	19.8	20.2	18.8

a Nonregistration.

b Not registration for entire period.

Table showing water supply and death rates from typhoid fever in 120 American cities having a population of 30,000 or over—Continued

CLASS III—CITIES HAVING LAKE OR UPLAND CONSERVED WATER SUPPLIES—Continued

City	Population, 1900	Source of supply	Method of artificial purification	Death rates from typhoid fever per 100,000 of population.							
				1900	1901	1902	1903	1904	1905	1906	Mean rate, 1902 to 1906
Johnstown, Pa.	35,936	Mountain reservoirs with Stony Creek auxiliary.	None.	130.8	116.4	36.0	22.5	34.1	45.1	55.5	38.6
Lynn, Mass.	68,513	Storage reservoirs.	None.	19.0	14.2	12.5	17.7	23.9	23.4	15.2	18.5
Malden, Mass.	33,664	Impounding reservoirs.	None.	20.8	29.0	25.4	19.3	26.9	10.5	23.1	21.0
Milwaukee, Wis.	285,315	Lake Michigan.	None.	19.3	22.1	15.1	16.8	13.6	22.7	30.5	19.7
New Bedford, Mass.	62,442	Impounding reservoirs.	None.	40.0	30.9	35.7	50.3	20.8	8.1	10.4	25.1
New Haven, Conn.	108,027	Lakes.	Part filtered by sand filters, installed 1902.	25.0	94.4	39.1	36.6	27.4	42.8	53.6	39.9
New York (Manhattan and Bronx boroughs).	2,050,600	Conserved reservoirs.	None.	17.6	19.5	18.2	15.8	13.3	12.9	15.0	15.0
Newark, N. J.	246,070	Conserved river supply.	None.	21.1	23.8	19.6	22.9	13.6	14.1	17.6	17.6
Norfolk, Va.	46,624	Lakes.	Mechanical filters.	79.3	33.5	51.9	59.7	58.2	37.9	73.2	56.2
Oakland, Cal.	66,960	Impounding reservoirs.	None.	23.9	11.7	23.1	21.3	43.3	35.8	(a)	(a)
Pawtucket, R. I.	39,231	Abott run conserved and impounded.	None.	22.9	12.5	24.5	19.2	23.5	6.9	9.0	16.6
Portland, Me.	50,145	Sebago lake.	None.	41.9	29.4	28.9	32.3	28.0	25.8	16.3	26.3
Portland, Oreg.	90,426	Upland reservoirs since 1895.	None.	35.4	21.5	36.5	35.5	25.6	34.6	41.0	34.6
Reading, Pa.	78,961	Conserved streams.	Part filtered by slow sand filters.	48.1	53.1	66.2	31.7	33.3	25.8	39.5	39.3
Rochester, N. Y.	162,608	Hemlock lake.	None.	17.2	17.4	11.8	12.1	15.8	11.5	17.3	13.7
Salem, Mass.	35,956	Impounding reservoir and lakes.	None.	22.3	24.8	24.6	46.0	21.5	26.6	34.2	30.6
Salt Lake City, Utah.	53,531	Upland reservoirs.	None.	39.2	79.0	72.4	61.3	74.1	101.8	67.0	75.3
San Francisco, Cal.	342,782	Impounded mountain streams.	None.	30.3	25.1	29.6	25.0	31.4	23.9	(a)	(a)
Scranton, Pa.	102,026	Upland reservoirs.	None.	34.3	34.4	19.6	18.2	10.7	17.2	61.5	25.4
Somerville, Mass.	61,643	Impounding reservoirs.	None.	16.2	19.0	7.7	13.6	17.7	13.0	14.1	13.2
Springfield, Mass.	62,059	Impounded streams.	Part filtered.	27.4	28.0	19.5	23.2	15.4	27.2	21.1	21.3
Syracuse, N. Y.	108,374	Skaneateles lake.	None.	29.5	19.1	8.0	17.6	18.2	17.1	10.1	14.2
Taunton, Mass.	31,036	Lakes.	None.	25.8	29.0	22.6	19.4	6.5	9.7	35.5	18.7
Waterbury, Conn.	51,139	Impounding reservoirs.	None.	48.9	32.1	32.9	30.1	20.6	31.6	24.2	27.9
Wilkesbarre, Pa.	51,721	Upland reservoirs.	None.	(b)	(b)	(b)	(b)	(b)	(b)	31.6	(c)
Worcester, Mass.	118,421	Impounding reservoirs.	None.	25.3	21.6	13.9	15.3	6.3	21.1	11.5	13.6

CLASS IV—CITIES HAVING BOTH SURFACE AND UNDERGROUND WATER SUPPLIES

Akron, Ohio	42,728	Summit lake and drilled wells.	None	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
Canton, Ohio	30,667	Nimishillen creek West Branch and drilled wells.	None	29.3	16.1	12.7	21.9	30.8	13.2	23.4	20.4
Columbus, Ohio	125,560	Shallow wells, infiltration galleries, Scioto river, and Alum creek.	Mechanical filters under construction.	53.4	48.1	37.1	37.6	147.7	85.1	37.1	68.9
Denver, Colo	133,859	Upland reservoirs and collecting galleries.	Both slow sand and mechanical filtration.	40.3	48.7	60.6	55.7	30.3	40.6	68.5	51.1
Indianapolis, Ind	169,164	Collecting galleries, deep wells, and filtered water from White river and Fall creek.	Slow sand filters for river water in operation fall of 1904; at same time collecting galleries abandoned.	41.4	33.1	44.5	51.1	68.4	30.2	39.2	46.7
Los Angeles, Cal	102,479	Los Angeles river and collecting galleries.	None	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
McKeesport, Pa	34,227	Youghiogheny river and shallow wells.	Filters projected	70.1	81.5	81.3	81.0	133.6	85.7	142.7	104.9
New York (Brooklyn borough).	1,166,582	Mixed surface and ground waters.	None	25.0	22.4	24.3	19.4	22.4	21.3	16.2	20.7
St. Paul, Minn	163,065	Conserved lakes and deep wells.	None	21.5	13.5	13.6	10.4	13.7	10.7	21.1	13.9

[a] Rate not shown.
[b] Nonregistration.
[c] Not registration for entire period.

NAVIGATION RESOURCES OF AMERICAN WATERWAYS

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The primary purpose of this paper is to describe the water transportation system within the United States, to state what has been spent upon improving our waterways, to give the facts regarding the present use of our lakes, canals, and rivers, to point out and account for the progress of the coastwise and Great Lakes commerce, and to explain the decline of the traffic upon canals and upon most of our rivers. In order to add to the significance of the data regarding the United States, the mileage and traffic of the inland waterways of England, France, and Germany are given. The discussion closes with a summary of the facts and conditions that indicate a larger use of American waterways in the future.

THE WATER TRANSPORTATION SYSTEM IN THE UNITED STATES

The inland waterways of the United States comprise about 25,000 miles of navigated rivers, a nearly equal mileage of streams that can be made navigable by the improvement of their channels and the regulation of the flow of their waters, the five Great Lakes with a combined length of 1,410 miles, and 2,120 miles of operated canals. In addition to these rivers, lakes, and canals there are 2,500 miles of sounds, bays, and bayous, capable of being converted by means of connecting canals aggregating less than 1,000 miles in length, into a continuous and safe inner route for the coastwise traffic of the Atlantic and Gulf. The waterways in our country—rivers, canals, lakes, and coastal channels—have an aggregate length of between 55,000 and 60,000 miles, and only about half of the entire mileage is now used for navigation.

EXTENT AND COST OF WATERWAY IMPROVEMENTS

Considering the great length and undoubted value of our inland waterways, comparatively little has been done to make them commercially useful. The most effective work has been done in improving the harbors and channels of Lakes Superior, Michigan, Huron, and Erie, where natural depths of eight and twelve feet have been increased to twenty-one, with the result that the freight now shipped on the Great Lakes—75 million tons in 1906—is three times what it was in 1890. The traffic passing the St. Mary's locks rose from a million and a quarter tons in 1880 to seven and a half millions in 1889, and to forty-one and a quarter million tons in 1906, an increase of 3200%. This commerce on the Great Lakes has been made possible by total congressional appropriations of less than a hundred million dollars.[a]

The total appropriations made by Congress from the beginning to 1907 for the rivers of the Mississippi valley amount to $208,484,720. This seems to be a relatively large sum; but it should be remembered that on some rivers, particularly the Mississippi, appropriations have been largely spent in levee construction and other work which, while indirectly helpful to navigation, was intended primarily to prevent the rivers from destroying the lives and property of those living on or near its banks. With the exception of the Ohio (including the Monongahela and Kanawha) and Mississippi and a few other large rivers, relatively little has been expended since 1890 by the Federal Government in bettering river navigation. When we consider that the United States has spent during the past hundred years in regulating, improving, and extending our system of natural waterways only 4¼% of the amount private capitalists have invested in the construction of railways, our congressional appropriations for the betterment of inland navigation seem to have been conservatively small.

In the canalization of rivers the United States is making some headway, portions of twenty-three streams having been canalized to an aggregate length of 1,520 miles in 1906. This, however, was a gain of but 442 miles over the figures for 1889. When only the more important rivers shall have been adequately canalized there will be several times 1,500 miles of slackwater navigation.

The United States operated 12 canals in 1906 with a combined length of 78.19 miles. These, however, were constructed to overcome obstructions to lake and river navigation and were not independent waterways. In 1907 the Hennepin Canal from the Mississippi river at Rock Island to the Illinois river at its great bend was put in operation by the United States, and this waterway, 96 miles long, is the first of its kind to be managed by the Federal Government. Nearly all of the canals in the United States belong to the States or to corporations. The only really important State canal is the Erie, now being modernized by the people of New York.[b]

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[a] See Appendix I at the end of this paper for table of Congressional Appropriations for River and Harbor Improvements.

[b] See Appendix I, table 2, for number, mileage (including slack water), and cost of canals and canalized rivers in the United States: 1906, 1889, and 1880.

It is not difficult to understand why the American People have been far more interested in railway extension than in the general development of waterways. But not all that can be understood can be justified. There has been an unwarrantable neglect of the transportation resources which this country possesses in its unrivaled systems of inland waterways.

LIMITATIONS UPON STATISTICAL INFORMATION CONCERNING INLAND WATERWAYS

One sure evidence that there has been and is neglect is the lack of public interest in having reliable information regarding our waterways and the use that is made of them. Provision was made twenty-one years since for the systematic collection and regular publication of detailed statistics of the railroads and their traffic; but as yet Congress has provided no machinery for recording and making public the facts concerning either the commerce moved or the craft operated coastwise or upon our inland waterways.

The highly valuable reports of the United States Commissioner of Navigation contain classified information regarding documented American vessels, the aggregate tonnage of which is about six and a half million tons; but there is an equal tonnage of undocumented craft not included in the tables published by the Bureau of Navigation. Comparatively few people are aware of the fact that American shipping has a total tonnage of over 13,000,000 tons gross register.

Similarly, the weighty and instructive publications of the Bureau of Statistics—the "Monthly Summary," the annual report on "Commerce and Navigation of the United States," and the "Statistical Abstract"—contain no statistics of the mileage of our inland waterways, no information as to the commerce moved coastwise, very little data regarding river traffic, and only such figures concerning canal shipments as are collected by the States. The statistics of the traffic on the Great Lakes are compiled; but even these statistics are acknowledged not to cover all the commerce moved on the Lakes.

The Bureau of the Census has about completed a report on "Transportation by Water" in the United States in 1906. This, like the preceding report of that Bureau, which was made in 1889, seventeen years ago, is a valuable document exceptionally complete as regards American shipping, but necessarily less satisfactory regarding passenger and freight traffic, for the simple reason that full and accurate information regarding traffic can not be obtained until machinery shall have been provided for the systematic and daily recording of freight and passenger movements.

In calling attention to the relatively small amount of information concerning transportation by water obtainable from the regularly published official reports of the Federal Government, there is no thought of criticizing the bureaus by which those reports are compiled and issued. The powers those bureaus possess and the scope of their activities are fixed by law. Congress decides what data the public shall have regarding our navigation resources and the use made of those resources. As the Inland Waterways Commission states in its preliminary report, this "information is essential to an intelligent treatment of the inland waterways and it is desirable that means be employed to obtain it"; and the Commission wisely includes in its recommendations "the adoption of means for ascertaining regularly all facts relating to traffic on the inland waterways, and for publishing the same in a form suitable for general use."

SHIPPING EMPLOYED ON AMERICAN WATERWAYS

According to the report on "Transportation by Water" recently made by the Bureau of the Census, American craft of all classes, exclusive of those in the fishing fleet and those owned by the Federal Government, numbered 39,083, and had a combined tonnage of 13,072,755 in 1906. Of this total there were 1,441 registered vessels—those employed in foreign commerce—and their tonnage amounted to less than a million (939,486) tons gross. Thus the craft constructed for domestic trade included 37,642 vessels with a tonnage of 12,133,269. In addition to this there was a fleet of 6,910 vessels with a total tonnage of 196,132, employed in catching and transporting fish, and a great host—82,443—of small boats and launches used in the fishing industry.

The census taken in 1906 shows that there were 37,321 vessels actively employed in domestic and foreign commerce of the United States, of which total 20,032 were operated from the Atlantic and Gulf coast, 2,537 on the Pacific coast (including Alaska), 2,990 on the Great Lakes and St. Lawrence, 9,622 on the Mississippi river and its tributaries, and 2,140 on our other inland waters. The gross tonnage of the Great Lakes' fleet was 2,392,863, 18.4% of the total for all American merchant craft in 1906; the tonnage of boats and barges—mainly coal barges—on the Mississippi and its tributaries was 4,411,967, 34.2% of the total; and the tonnage of the craft on other inland waters was 259,491, or 2.01% of all American shipping.[a] The tonnage of the river and canal craft thus amounted to 4,671,458, or 36% of the total of all active American shipping.

PAST AND PRESENT TRAFFIC OF AMERICAN WATERWAYS

The freight shipped on the Great Lakes in 1907 amounted to 83,498,171 tons; the total for the previous year—the one covered by the Census report now being published—was 75,610,690 tons, which was 42.6% of the total freight, exclusive of harbor traffic, handled upon American waterways coastwise and inland. The traffic of the Mississippi river and its tributaries in 1906 was 19,531,093 tons, or 11% of the total. On the other inland waterways the freight aggregated 3,716,765 tons, or 2.1% of the total. The combined traffic on the Great Lakes and our other inland waterways in 1906 was 98,858,548 tons, 55.7% of the total water-borne domestic commerce of the United States.

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[a] For further details regarding the number and tonnage of American shipping employed in the United States as a whole and upon each class of waterways, consult the tables contained in Appendix II.

Such was the traffic in 1906. Comparisons with the previous census of 1889 will show where progress has taken place and what waterways have gained and what have lost in tonnage. The most rapid growth has been in the commerce of the Great Lakes which rose from 25,266,978 tons of shipments in 1889 to 75,610,690 tons in 1906. The port to port traffic of the Mississippi river and its tributaries in 1906 amounted to 19,531,093 tons of freight. There was also handled locally in and about the harbors 8,325,548 tons, making a total of 27,856,641 tons for the rivers of the Mississippi valley. In 1899 the figures were 29,401,409, there having been a decrease of 1,544,768 tons in the 17 years. The freight handled on the other inland waterways of the United States experienced a very large decline during this period, the total tonnage of freight carried having fallen from 11,221,224 tons in 1889 to 3,944,655 tons in 1906.[a]

In order to make the statement of traffic complete the passenger business must be included. The highly efficient steamers of the lake lines carried 14,080,146 passengers in 1906; the figures for 1889 were 2,235,993, the increase during the 17 years being 529.7%. There was also an increase of 30% in the passenger traffic handled on the Mississippi river and its tributaries, the figures for 1889—10,858,894—having risen by 1906 to 14,122,241. It should be noted, however, that this increase was due more largely to the growth in short distance travel and in ferry traffic than to an increased patronage of the river steamboats operated over the longer routes. The passenger traffic on the other inland waterways of the United States in 1889 is not known, but it amounted to somewhat less than two millions (1,877,889) in 1906.

THE MILEAGE AND TRAFFIC OF THE INLAND WATERWAYS OF ENGLAND, FRANCE AND GERMANY

A comparison of the United States with some of the leading countries of Europe as to the extent to which the navigation resources of each country have been developed, and as to the traffic uses made of inland waterways will contribute to a clearer appreciation of the facts concerning the United States.

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[a] See tables in Appendix III.

Great Britain.—Although Great Britain is of small territorial area and has not followed the policy adhered to by the continental countries of retaining the inland waterways as public highways to be developed by the government, the mileage and traffic of her streams and canals are by no means insignificant. The tidal coast line of Great Britain, 3,900 miles in length, is supplemented by about 4,000 miles of canals and improved rivers. The traffic on these inland waterways, exclusive of the coastwise maritime commerce, amounted to 37,426,886 tons in 1898, the latest year for which official Board of Trade statistics are obtainable.

The five principal estuaries of England—the Mersey, Humber, Wash, Thames and Severn—are connected by 19 through canal routes. Nine of these through routes reach Severn ports, nine have London termini, ten reach Liverpool, and five terminate at Hull. The traffic is most active on the canals in central and northern England. The 642 miles of waterways in this highly developed industrial district moved 23,500,000 tons of freight in 1898. The canals reaching Birmingham had 7,750,000 tons of traffic.[a]

There is a widespread sentiment in the United Kingdom that the country has made a mistake in permitting its waterways to pass largely into the control of the railroads. Somewhat over two years since a Royal Commission on Canals was appointed to make a thorough investigation of the inland waterways of the country and their uses for navigation and other purposes. This body has gone about its work with the thoroughness characteristic of British royal commissions, and a comprehensive report will soon be issued. It is not probable that the British government will decide to nationalize the waterways of the country, although that policy is being advocated by numerous public bodies. Some of those who are not ready to go so far as nationalization, favor the creation of a canal trust "to acquire, develop, and extend and administer, in the public interest, canals and navigations in England and Wales." This is a proposal to apply to the canals the policy of control and operation that has been adopted for the administration of the principal ports of the country. The opposition of the private canal companies and the railroads, both to nationalization and to the establishment of a canal trust, may be expected to prevail—for the present at least. But it is highly probable that the Board of Trade or some other public authority will be given power not only over navigation but over all uses of water.

The water resources of Great Britain have come to be such a valuable asset to the country that the supply and the uses of water must be carefully guarded. If the streams are to be maintained as navigable waterways, if the municipalities are to have an abundant supply of pure water, the mining companies must not be permitted to continue their reckless waste of water; the disposal of sewage must be carefully planned so as to prevent the pollution of the streams; and if the valuable fisheries in the tidal and fresh water portions of the rivers are to be preserved, careful regulation will be necessary. In a word, the necessity for a permanent waterways commission in Great Britain is becoming apparent.

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[a] For details in regard to British waterways, consult Appendix IV.

France.—France has developed her inland waterways more systematically and completely than has any other of the larger European countries; 3,062 miles of canals are now in operation and 4,500 miles of her rivers—largely as the result of canalization—are used for navigation. Prior to 1880, the greater portion of the freight business of the country was handled on the waterways. Since then the development of the railroads has naturally enabled them to exceed the waterways in tonnage; but the waterways have, none the less, transported a steadily increasing tonnage. During the twenty years from 1885 to 1905 the freight tonnage rose from 19,573,000 to 34,030,000 metric tons. The ton mileage of the water-borne traffic amounted to 3,178,000,000 in 1905 and was more than double the total for 1885. All the waterways of the country, with the exception of 160 miles (75 of which are owned by the city of Paris) are public ways improved and maintained by the State. Their use is free, tolls having been abolished in 1880.

Germany.—The policy of Germany in the development of her inland waterways is peculiarly instructive. The canals and navigable rivers of that empire, not including the tidal portions of the rivers navigated by sea-going vessels, have a total length of about 7,600 miles, of which about 6,250 miles may be considered to be commercially important. Three-tenths of the 6,250 miles consist of canals and slack water river navigation, and seven-tenths of river courses improved without the construction of dams and locks. The railway mileage of the country is 34,000, somewhat over six times the length of the waterways actively used for commerce.

The tonnage of the shipments and receipts of freight transported on the German waterways in 1875 was 20,800,000 metric tons. The figures for 1905 were 103,400,000 metric tons, there having been an increase of nearly 400%. The ton mileage of this water-borne commerce in 1875 was 1,812,500,000, and in 1905, 9,375,000,000—a gain of over 400%. The ton mileage of the railroad freight traffic in 1875 was 6,812,500,000, and in 1905 the total was 27,875,000,000. The gain in the railroad traffic was far greater absolutely; but the percentage of increase in water traffic was larger, although the length of the waterways in 1905 was not much greater than in 1875, whereas the railway mileage had more than doubled during that period.

The density of traffic on the German waterways much exceeds that on the railroads. The number of tons carried one mile per mile of waterway rose from 290,000 in 1875 to 1,500,000 in 1905; the corresponding figures for the railways were 410,000 tons carried one mile per mile of line in 1875, and 820,000 in 1905. The relative importance of the traffic of the railways and waterways in Germany is shown by the fact that 25% of the total ton mileage of rail and water traffic in 1905 was water-borne, and 75% moved upon rails. Thirty years earlier the waterways had 21% and the railroads had 79% of the combined ton mileage.[a]

These brief references to England, France, and Germany suffice to show that the United States has as yet done less than has been done by her leading industrial and commercial rivals in the development and use of inland waterways, if we except—as of course we ought—the chain of Great Lakes which have no counterpart in any other country. Whether it is desirable that the United States should follow the example of France and Germany as regards inland water transportation is a question to which the American people are now giving serious thought. There can be no uncertainty as to the importance of the transportation services performed by our coastwise shipping, and by the fleet operated on the Great Lakes. The coastwise and Great Lakes traffic is rapidly growing; but upon our canals and many of our rivers, traffic languishes or declines.

Is it wise, it may be asked, for the United States to spend money in constructing canals and improving our rivers, and if so under what conditions and to what extent? This is too large a question for one to attempt to answer fully in a short paper, the primary purpose of which is to present data rather than to draw conclusions; but some indication as to what policy may best be adopted may be given by calling attention briefly to the causes that account for the decline in canal and river traffic and by stating certain facts which seem to indicate that well-developed inland waterways may assist largely in the future economic progress of our country.

CAUSES OF THE DECLINE IN CANAL AND RIVER TRAFFIC

The causes accounting for the decline in the traffic upon our canals and rivers have been so clearly stated by the President in his addresses and in his special message of February 26, 1908, transmitting to Congress the preliminary report of the Inland Waterways Commission, and the same subject has been so fully presented in that report that a detailed discussion of those causes seems unnecessary.

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[a] Consult Appendix V for tables showing rail and water traffic in Germany.

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The primary reason for the decline in the use of canals of such small dimensions and river channels so shallow as to permit the use only of craft capable of transporting 100 to 200 tons of cargo, is to be found in the very success which the railways of the United States have had in providing cheap transportation for heavy and bulky commodities. In no other country of the world have rail transportation costs been reduced to such a low figure. The ability of our railroads to handle this class of traffic so economically has resulted not only from the genius of the American people in the use of machinery to do man's heavy work, but also, and more largely, from the fact that by far the greater share of the tonnage of American railroads consists of such bulky commodities as coal, iron ore, lumber and grain, which can be handled not only in carload lots but in train-loads, and which, from the very size of our country, must be moved long distances in order to reach the manufacturing centers of the United States and the primary markets within and without our borders.

In many other countries it has been found more economical to do the heavier transportation work by making large use of waterways, and to develop the railway traffic more particularly with reference—and this is especially the case in England, France and Germany—to the speedy movement and schedule delivery of parcels, packages and general commodity freight. This organization of the transportation service by rail is possible where there is a division of the transportation work between the railroads and waterways, and it results in the close co-ordination of railroad freight traffic with the wholesale and retail trade. It enables merchants and manufacturers to reduce capital costs and warehousing expenses to a minimum. It meets the needs of densely populated and highly developed industrial countries such as France and Germany, and especially of such a country as Great Britain, for, although the inland waterways of Great Britain are, as a whole, less carefully developed than are those of France and Germany, a large share of the domestic commerce of the United Kingdom is carried by water. The navigation services which most countries can secure only by means of inland waterways, the island of Great Britain, with its 3,900 miles of tidal coast, obtains upon the surrounding ocean—the best of all highways.

Such an organization of the business of transportation as has been worked out in the three European countries just mentioned does not result in as low average freight rates by rail as prevail in the United States; but the costs of wholesale and retail distribution and of many manufacturing activities are undoubtedly less than they would be were the people of Europe served almost entirely by railroads and not by railroads and waterways. Our dependence upon railroads, almost exclusively, for the movement of bulky commodities long distances even at low average rates, while we at the same time neglect the development and use of our inland waterways, does not necessarily mean that we have organized our work of production and distribution in the most economical manner. Indeed, there can be little doubt that as social and industrial conditions in the United States approach more closely those prevailing in Europe, we shall find it increasingly desirable to provide ourselves both with well-developed waterways for handling much of our bulky traffic and with railroads more efficient than present conditions permit them to be in the handling of package freight. We, as well as Europe, will find it profitable to minimize capital and warehousing costs.

The construction of canals and the improvement of rivers in the United States have progressed slowly, in part at least, because the Federal Government has in the past left to the States the work of canal building, and, to some extent, the canalization of rivers. Several of the States, after having made costly mistakes in the execution of their earlier works of internal improvement, have been disposed to leave to private capital the creation of such waterways as special business interests might find it profitable to establish. In many instances the States have thought best to dispose of their waterways to the railroad companies, which have generally found it unprofitable to maintain both rail and water routes. The policy of leaving the development of water transportation to any considerable extent either to the States or to private corporations, is now realized to be wrong in theory and unsatisfactory in practice.

The States are manifestly incompetent to carry out the improvement of our national waterways, such as the Mississippi, Ohio, Missouri and Columbia rivers. Their development has always been a national concern. The construction of such waterways as the Erie and Panama canals are clearly works that private capital is neither able nor disposed to execute. The great State of New York has the financial ability and economic incentive to reconstruct the Erie canal; but its route is so clearly national that the waterway should long since have been taken over and enlarged by the Federal Government.

The experience of our own country and of other nations shows conclusively that waterways should be public ways—that their execution and maintenance should be by the Government. The entire network of American waterways should be improved and extended systematically by one authority, and with reference to the economic and social needs of the entire nation. There is only one power whose authority is as wide as our country, and that is the Federal Government. In the future but small place in the development and control of waterways will be given either to the States or to private corporations.

WELL-DEVELOPED INLAND WATERWAYS WILL AID OUR FUTURE ECONOMIC PROGRESS

There can be no doubt that the inland waterways of the United States will be more extensively used in the future than they have been in the past. The reasons for this are conclusive:

1. The internal commerce of the United States is growing rapidly and is certain to increase with accelerating speed. The demands for transportation facilities are expanding so swiftly as to make it apparent that the products of our farms, mines, forests, and factories can not secure ready and economical transportation unless at least the larger trunk line water routes of the country are adapted to the needs of commerce.

2. The necessity for the development of our waterways is emphasized by the fact that any considerable future reductions in the costs of rail transportation are improbable. Indeed, for reasons that have already been stated in this paper, the service of American railroads may be expected to be developed in the future more and more with reference to handling commodities expeditiously and in small units. That is what is taking place in other countries; there is no reason to suppose that our experience will differ greatly from theirs. The economy of employing both railroads and waterways for the performance of the transportation services becomes greater in every country and in particular sections of a country with the increase in population and the development and specialization of industry.

3. American waterways will, in the years to come, be utilized more for navigation, because we are certain, sooner or later, to conserve and use the entire water resources of the country simultaneously not only for navigation, but also for irrigation, for water power, and for supplying our urban populations with pure water. Moreover, the growing necessity for controlling our streams so as to make possible the reclamation of our vast areas of reclaimable lands will tend to hasten the time when our principal waterways will be so regulated as to be serviceable for navigation.

In the past we have permitted the reckless destruction of our forests, and it has been our practice to let the streams spread their floods destructively over their valleys and hurry their surplus water to the sea. We can not long afford to be so wasteful of one of our greatest natural resources. We ought to, and we shall, reforest our wild mountain areas, we shall hold back the flood waters to irrigate our arid lands, to turn the wheels of industry, to maintain the channels of navigation, to give the towns and cities their water supply, and to equalize the seasonal flow of our rivers so that neither flood nor low water shall be a recurring menace to life and property.

Statement by Professor Emory R. Johnson

APPENDIX I

TABLE 1—*Congressional appropriations for the survey, improvement, and maintenance of harbors and waterways of the United States, by periods and divisions*

Division	Date of earliest appropriation	Appropriations			
		Total	Up to and including 1890	1891 to 1906, inclusive	March 2, 1907
Total	1802	[a] $552,943,025	$214,039,886	$301,447,046	$37,456,093
Atlantic coast	1802	141,162,391	56,448,541	73,821,326	10,892,524
Gulf of Mexico	1826	64,292,362	21,065,470	38,027,940	5,198,952
Pacific coast	1852	34,061,782	10,248,592	21,204,844	2,608,346
Great Lakes	1823	97,791,108	37,522,937	50,980,283	9,287,888
Mississippi valley	1819	208,484,720	84,211,783	115,457,054	8,815,883
Lake Champlain	1836	1,347,910	1,133,660	211,750	2,500
General	1824	[b] 5,802,752	3,408,903	1,743,849	650,000

[a] Does not include appropriations for the following: California Débris Commission, Permanent International Commission of Congresses of Navigation, International Waterway Commission, improvement of harbors and waterways in insular possessions, prevention of deposits in New York harbor, bridge construction.

[b] Includes general appropriation items for removal of wrecks, examinations, surveys, and contingencies which are not capable of being segregated according to divisions.

Up to and including 1890 the congressional appropriations amounted to 38.7% of the total shown in this table. From 1891 to 1906, inclusive, 54.5% of the total was appropriated, while the rivers and harbors act of March 2, 1907, authorized the expenditure of 6.8%. The waterways of the Mississippi valley, including the Red river (of the North), have received 37.7% of all congressional appropriations for the improvement and maintenance of harbors and waterways; the harbors and streams of the Atlantic coast, 25.5%; those of the Great Lakes, 17.7%; the Gulf of Mexico, including the delta and passes of the Mississippi, 11.6%; the Pacific coast, 6.2%; and Lake Champlain, two-tenths of 1%.

TABLE 2—*Comparative summary—number, mileage (including slack water), and cost of canals and canalized rivers in the United States, 1906, 1889, and 1880*

	State and private canals	Government canals	Canalized rivers	Total
Number:				
1906	29	12	23	64
1889	37	9	21	67
1880	39	2	11	52
Mileage:				
1906	2,046.01	78.19	1,520.40	3,644.60
1889	2,264.60	40.63	1,078.04	3,383.27
1880	2,746.18	10.00	479.60	3,235.78
Cost:				
1906	$213,797,297	$26,524,588	$42,886,978	$283,208,863
1889	150,481,825	20,517,133	17,186,922	188,185,880
1880	167,205,810	7,832,009	8,914,483	183,952,302

APPENDIX II

Number and tonnage and passenger traffic of American shipping employed in the United States as a whole and on each division of waterways, 1906 and 1889

[Vessels operating as connecting links in railroad systems did not uniformly report the tonnage of freight carried or income for the year. In addition to the craft reported in this table there were 1,762 vessels with a gross tonnage of 179,326 reported as idle in 1906, and 1,490 with a gross tonnage of 233,639 reported as idle, untraceable, or lost prior to or during 1889.]

Division	Census	Number of vessels	Gross tonnage	Value of vessels	Gross income	Number of employees	Wages	Number of passengers carried
Total	1906	37,321	12,893,429	$507,973,121	$294,854,532	140,929	$71,636,521	366,825,663
	1889	30,485	8,359,135	206,992,352	161,994,066	113,870	41,482,812	198,992,438
Per cent of increase		22.4	54.2	145.4	82.0	23.8	72.7	84.3
Atlantic coast and Gulf of Mexico [a]	1906	20,032	4,851,421	273,105,915	159,759,924	77,124	38,352,259	292,555,416
	1889	12,238	2,658,445	116,042,062	90,147,632	[b] 63,625	[b] 22,123,099	170,225,458
Per cent of increase		63.7	82.5	135.4	77.2	21.2	73.4	71.9
Pacific coast (including Alaska)	1906	2,537	977,687	76,622,633	48,520,139	20,142	12,950,399	44,189,971
	1889	1,635	419,157	21,824,040	19,872,738	11,315	5,880,421	15,672,093
Per cent of increase		55.2	133.2	251.1	144.1	78.0	120.2	182.0
Great Lakes and St. Lawrence river	1906	2,990	2,392,863	130,805,640	65,274,702	24,916	13,280,716	14,080,146
	1889	2,737	920,284	48,580,174	35,463,852	22,726	8,098,191	2,235,993
Per cent of increase		9.2	160.0	169.2	84.0	9.6	64.0	529.7
Mississippi river and its tributaries	1906	9,622	4,411,967	22,852,142	17,342,038	15,016	5,692,117	14,122,241
	1889	7,300	3,364,610	14,407,162	16,331,872	15,951	5,337,185	10,858,894
Per cent of increase		31.8	31.1	58.6	6.2	[c] 5.9	6.7	30.0
All other inland waters	1906	2,140	259,491	4,586,791	3,957,729	3,731	1,361,030	1,877,889
	1889	6,575	996,629	6,138,914	[d] 177,972	[d] 253	[d] 43,916	
Per cent of increase		[c] 67.4	[c] 74.0	[c] 25.3				

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[a] Totals for 1889 include 52 craft with a gross tonnage of 2,553, valued at $75,360, for which no report was made for income, employees wages, passengers, and freight carried.

[b] Does not include employees or wages for yachts.

[c] Decrease.

[d] Income, employees, and wages were not reported for canal boats at the census of 1889, and therefore the per cent of increase is not given.

APPENDIX III

TABLE 1—*Freight carried and income received for freight, exclusive of harbor work, by divisions, 1906*

Division	Freight (net tons)	Per cent of total	Income	Per cent of total
Total	177,520,799	100.0	$175,545,361	100.0
Atlantic coast and Gulf of Mexico	65,360,958	36.8	83,890,161	47.8
Pacific coast (including Alaska)	13,301,293	7.5	29,340,102	16.7
Great Lakes and St. Lawrence river	[a] 75,610,690	42.6	52,076,533	29.7
Mississippi river and its tributaries	19,531,093	11.0	7,450,869	4.2
All other inland waters	3,716,565	2.1	2,787,696	1.6

[a] From the report of the Bureau of Statistics on the internal commerce of the United States.

TABLE 2—*Freight transportation, including harbor traffic, by divisions, 1906 and 1889*

Division	Census	Freight carried (net tons)	Per cent of total
Total	1906	265,546,845	100.0
	1889	129,851,658	100.0
Atlantic coast and Gulf of Mexico	1906	140,512,043	52.9
	1889	52,712,124	40.6
Pacific coast (including Alaska)	1906	17,622,816	6.6
	1889	11,249,927	8.7
Great Lakes and St. Lawrence river	1906	[a] 75,610,690	28.5
	1889	25,266,974	19.5
Mississippi river and its tributaries	1906	27,856,641	10.5
	1889	29,401,409	22.6
All other inland waters	1906	3,944,655	1.5
	1889	11,221,224	8.6

[a] From the report of the Bureau of Statistics on the internal commerce of the United States.

APPENDIX IV

The following information regarding the inland waterways of the United Kingdom is taken from a paper upon "The Inland Waterways of Great Britain and the Plans under Consideration for their Improvement," by Urquhart Forbes, Esq., London, England, and published in The Annals of the American Academy of Political and Social Science, January, 1908.

EXTENT OF THE BRITISH INLAND NAVIGATION SYSTEM

The total extent of the waterways of Great Britain and Ireland, as stated in a Return of the Board of Trade, 1898, which is the latest official record on the subject, is 3,906 miles 69½ chains, the mileage of those in England and Wales being returned as 3,167 miles 16¼ chains, that of those in Scotland 153 miles 21 chains, and that of those in Ireland 586 miles 32 chains. This estimate, however, can only be taken as approximately correct. It omits various waterways of which no official record has been preserved, such as Milford Haven, one of the finest harbors in the kingdom, which has between twenty and thirty miles of inland navigation; and it also differs considerably both from an earlier estimate of the board published in 1883 and from the estimates of various engineers who are recognized as authorities on the subject. The discrepancy between these various estimates appears to be mainly due to the omission from some of the waterways included in others and does not extend to mileage, and a comparison of their details with those given in the Board of Trade Return of 1898 shows that, after deducting 607 miles of waterway abandoned or converted into railway, the inland navigation system of the kingdom comprises about 3,793 miles in England and Wales, 341 in Scotland, and 629 in Ireland—a total of 4,764 miles. The estimates on which this conclusion is based are given in the subjoined table.[a]

	Board of Trade Return, 1883	Mr Couder, 1883	Mr Taunton, 1883 (England, Wales, and Scotland only)	Mr Lloyd, 1883 (England and Wales)	Mr Wells, 1895 (England and Wales)	Mr Vernon Harcourt, 1899
England and Wales	2,688	4,333 [a] 1,878	2,451 [b] 371	3,742 [b] 308	3,920 [b] 415	3,374
Scotland	85	354	190			120
Ireland	256	755				610
Total	3,029	7,320	3,012	4,050	4,335	4,106

[a] Feeders. [b] Derelict.

To these estimates may be added that of Mr Rudolph de Salis for England and Wales, as given in Bradshaw's Canals and Navigable Rivers of England and Wales, where the mileage for those countries is given as 3,915 miles, 842 miles of which are tidal and 3,073 non-tidal.

EARLY DEVELOPMENTS

During the seventeenth century this system of natural waterways was developed by a series of acts of Parliament empowering private individuals and bodies of individuals to improve the navigation of rivers and to make others not previously so, navigable. This movement was followed by the initiation by Brindley in 1795 of what may be termed the "canal era," during which all the navigable rivers of the kingdom were gradually connected with each other by means of a network of canals constructed by private enterprise in order to provide for the needs of different localities. In England and Wales the development of inland navigation, which began in 1423 with an act for removing obstructions in the Thames, may be said to have practically ended with the completion of the Manchester ship canal in 1894, and has thus extended over four and a half centuries. In Ireland it began only in 1715, with the improvement of the Maigue river, and ended with the completion of the Ballinamore canal in 1859; and in Scotland it was limited to the eighty-eight years between the passing of the first Clyde improvement act in 1759 and the completion of the Caledonian canal in 1847.

VARIETIES OF WATERWAYS

It has, however, proceeded on the same lines in each of the three kingdoms, the inland navigation systems of each of which include the three following varieties of waterway:

1. Tidal navigable rivers, the soil of the bed of which is vested in the Crown for the benefit of the public, and on which all the subjects of the Crown enjoy the right of free navigation

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[a] Of the following estimates, those of Mr Couder, C. E., Mr Taunton, C. E., and Mr Lloyd, C. E., were prepared for the select committee on canals, 1883; that of Mr Wells, C. E., for the Birmingham Conference, 1898, on Inland Navigation, organized by the Institution of Mining Engineers; and that of the late Mr Vernon Harcourt, C. E., is contained in a paper on the subject read before the Society of Arts, 1899. To these might be added, did space permit, an estimate of the Irish waterway system contained in the report of a commission on the subject, of 1882, which gives the total extent as 708 miles 20 chains.

2. Non-tidal rivers which have been made navigable, and tidal rivers the navigation of which above the tideway has been improved under an act of Parliament, the ownership of the soil of which is, in both cases, for the purposes of navigation only, vested in commissioners or conservators appointed under the act who are entitled to demand tolls for the use of the river, which are devoted solely to the maintenance of the navigation.

3. Canals constructed by private enterprise by companies incorporated under special acts, who are the sole owners of their respective undertakings and are entitled to all the profits accruing from the tolls payable under these acts by the public for their use.

STATE OWNERSHIP AND CONTROL

In England and Wales state ownership of waterways is limited to the soil of the bed of tidal rivers, as above mentioned, and the state has never contributed in any way to the development of water conservancy. In both Scotland and Ireland, however, it has not only made large grants from the treasury for this purpose—the total expenditure on the Caledonian canal in the former country, for instance, amounted to £1,280,000, and the grants for the Royal canal of Ireland to £359,776—but is also the owner of the Caledonian canal (constructed entirely by it) and the Crinan canal in Scotland and of the Maigue, Boyne, Tyrone and Shannon river navigations in Ireland, where it also originally owned both the Grand and the Ulster canals. The Board of Trade is the central authority for the control of inland navigation, and has the power of providing for the inspection of waterways the condition of which is dangerous to the public, or liable to cause obstruction to traffic, and for their transfer to local authorities, or, if necessary, their abandonment. English canal companies are also required to send to the registrar of joint stock companies annual returns stating the address of the office and principal officers of the company; and the governing authorities of all waterways are under the obligation of furnishing the Board of Trade, when required to do so, with particulars respecting their works, capacity for traffic, and capital, revenue, expenditure and profits.[a] The Caledonian and Crinan canals in Scotland are controlled by commissioners appointed by the Crown, and those owned by the state in Ireland by the commissioners of public works in that country, and both of these bodies report annually to Parliament.

CONSERVANCY AUTHORITIES

The governing bodies of the different waterways comprised in the British inland navigation system vary very greatly both in size and constitution, and in addition to the canal companies include bodies of conservators, commissioners, port and harbor authorities and municipal corporations. The conservancy authorities of a few of the more important rivers are of a representative character. The conservators of the river Thames, for instance, are thirty-eight in number and include representatives of the Admiralty and two other government departments, of the city and the county of London, of the London Water Board, and of the county or borough councils of the eleven counties traversed by the river. The thirty commissioners of the Severn represent the counties of Gloucestershire and Worcestershire, and the corporations of all the towns on the banks of the river from Bristol to Wenlock in Salop, while the tidal portions of both the Mersey and the Clyde are controlled by trusts on which the municipalities of Liverpool and Glasgow are largely represented, as well as the conservators of the navigation of those rivers.

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[a] This power has been exercised by the board only twice since it was first conferred on it by the Railway and Canal Traffic Act, 1888.

GROUPS OF WATERWAYS IN ENGLAND

The waterways of England and Wales are divisible into six groups, one of which has its center in Birmingham, while the other five unite wholly or partially in the estuaries of the Humber, Mersey, Wash, Thames and Severn. The Thames and Severn are united by 648 miles of waterway; the Thames and Humber by 537 miles; the Severn and Mersey by 832 miles and the Mersey and Humber by 680 miles, while the ten waterways flowing into the Wash have an extent of 431 miles. London is connected with Liverpool by three through routes, with Hull by two and with the Severn ports by four; Liverpool with the Severn ports by two, with Hull by three, with the South Staffordshire mineral districts by two; and the last-named districts with the Severn ports by three routes. Though, however, nine of these nineteen through routes terminate in the Severn ports and nine in London as against ten in Liverpool and five in Hull, the southern waterways are now of far less importance than those of the northern counties. No less than 23,500,000 tons of 37,426,886 which according to the Board of Trade returns, 1898, was the total traffic on English and Welsh waterways in that year, was concentrated round an area bounded by the Birmingham and Shropshire Union canals, the Leeds and Liverpool canal, the Aire and Calder navigation, the Don navigation, a line from Sheffield to Stoke, and the Trent and Mersey navigation—a mining and manufacturing district, the waterways of which have a united length of only 642 miles. The traffic of the Birmingham canals amounts to 7,750,000 tons; that of three other systems of waterways within this area to between 2,000,000 and 3,000,000 tons; that of three to between 1,000,000 and 2,000,000 tons; and that of seven to between 500,000 and 1,000,000 tons. Only three waterways within this district have less than 100,000 tons traffic, but the Grand Junction canal is the only waterway extending into the southern counties which has a traffic exceeding 1,000,000 tons, and only three (the Stafford and Worcester canal, the river Lea and the Thames between Oxford and London) have a traffic exceeding 500,000 tons.

SCOTTISH WATERWAYS

In Scotland, though the Tay—navigable for 95 miles up to Perth for vessels of 200 tons—the Tweed and the Dee have been utilized for purposes of navigation, the Clyde and the Forth are the only two navigable rivers of importance. The country possesses only five canals, two of which, the Caledonian and the Crinan, though remarkable as engineering works, have proved of little value for purposes of trade, and in 1898, when the total traffic amounted to only 1,223,304 tons, the only waterways having a traffic exceeding 100,000 tons were the Forth and Clyde navigation and the Edinburgh and Glasgow Union canals. Scotland, however, possesses special advantages as regards inland navigation in the extent and number of its navigable lakes and in the fact that the firths of its two principal rivers—the Forth and the Clyde—are not separated by any range of hills and penetrate the plain between them on opposite sides, dividing the country, the breadth of which is there reduced to 50 miles, in halves.

IRISH WATERWAYS

Ireland, which, like Scotland, has numerous large navigable lakes, has an excellent system of waterways, which comprises both the longest river and one of the most extensive canals in the United Kingdom—the Shannon, 143 of the 256 miles of which are navigable, and the Grand canal, which is 163 miles long and has ten branches. Owing, however, probably to the absence of manufacturing and mining industries in the country, the total traffic in 1898 amounted to only 708,174½ tons, 309,288 tons of which was concentrated on the Grand canal, which, with the Lagan canal, with a traffic of 171,784 tons, are the only two on which the traffic exceeded 100,000 tons, while the Shannon, with 83,688 tons, was the only waterway on which it exceeded 50,000 tons.

PRINCIPAL RIVERS OF THE UNITED KINGDOM

The rivers of the United Kingdom with the greatest extent of navigation are the Thames, 215 miles long, which is navigable for 145 miles; the Severn, about two-thirds of the 200 miles of which are navigable; the Shannon, navigable for 143 miles out of its total length of 256 miles, and the river Forth, in Scotland, which, though only 72 miles long, is navigable for 50 miles. The short tidal navigations of the Tyne, Wear, Tees and Humber, on the east side of the Clyde, Mersey, Ribble and Bristol Avon on the west coast, though none of them much exceed 20 miles in length, are, however, of far greater importance for commercial purposes.

THE MANCHESTER SHIP CANAL

The most important of the British canals, both commercially and from an engineering point of view, is the Manchester ship canal, begun in 1885 and opened for traffic on May 21, 1895, on which £15,173,402 was expended—a total which included £1,786,313 paid for the Bridgwater canal and £1,214,451 for compensation paid to various bodies possessing vested interests in the land it traverses. The canal, which is 35½ miles long and from which no less than 53,000,000 cubic yards of soil were excavated,[a] consists of three sections. The first of these runs from Eastham to Runcorn, near or through the Mersey estuary, a distance of 12¾ miles, and is provided with three tidal locks with chambers 600 feet by 80 feet, 350 feet by 50 feet, and 150 feet by 30 feet, with sills 28 feet, 25 feet, and 16 feet, respectively, below the normal water level of the canal. The second section runs from Runcorn to Latchford, near Warrington, 8½ miles, where it is inland, but in which the level of the water as in the first section is raised by the tides; and the third from Latchford—where the locks stop the tidal action and the canal is fed by the Mersey and Irwell up to Manchester. One of the most notable features of the work is the swing aqueduct for the Bridgwater canal, the first of its kind, by means of which, when closed, traffic can pass along the latter canal as heretofore, but which can be opened to allow of ships crossing it on the lower level of the ship canal. This aqueduct, constructed by Sir E. Leader Williams to replace that built by Brindley 136 years previously, was the first "fixed" aqueduct constructed in the United Kingdom. It may be added that the Manchester ship canal is the first large ship canal constructed with locks raising vessels 60½ feet and transporting them inland.

THE CALEDONIAN CANAL

Though it failed to realize the main objects for which it was constructed, the Caledonian canal, having regard to the physical difficulties overcome in its construction and the period at which it was made, must be regarded as being scarcely less remarkable as an engineering feat than the Manchester ship canal. Its length is 60 miles, 37½ miles of which consist of four naturally navigable freshwater lochs connected by a series of canals 23 miles in length, and it extends diagonally across Scotland from Fort William on the Atlantic to Clachnaharry on the shore of Beauly Firth on the North Sea, and thus provides a means of enabling vessels to avoid the dangers and delays incident to the 500-mile voyage by the Orkneys and Cape Wrath. There are docks both at Corpach and Clachnaharry, the latter of which cover an area of 32 acres, and one of its most remarkable features is a series of eight connected locks, called by Telford "Neptune's Staircase," constructed to overcome the difficulty caused by the difference in the levels between Lochs Lochy and Eil, which, though the distance is only 18 miles, amounts to 90 feet. The canal is one of the finest monuments of Telford's genius, and is also notable as the only British waterway which has been constructed entirely at the cost of and has always remained under the control of the state.

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[a] Ninety-seven excavators, eight large bucket ladder dredgers and fifty-eight steam navvies were employed on the work besides some small dredgers.

THE GRAND CANAL OF IRELAND

The total expenditure by the state on the Caledonian canal was £1,300,000, and it also contributed £321,674 out of the £1,370,000 expended on the Grand canal in Ireland, which is the most important waterway in that country, and though its total length of 163 miles is exceeded by that of the Shropshire Union, which is 200 miles long, it is, as has been said, the most extensive waterway in the United Kingdom. It extends southward from Dublin to New Ross in Wesford and westward to the Shannon harbor, where the trade-boats of the company transship into steamers plying northwards to Athlone and southwards to Limerick, while on the other side of the Shannon it runs to Ballinasloe and has no less than ten branches connecting it with the Liffey and various trading centers.

OTHER ENGLISH CANALS AND THEIR EARNINGS

Among other English canals the next in length to the Shropshire Union are the Grand Junction, 188 miles long; the Birmingham canals, with a united length of 158 miles, and the Leeds and Liverpool canal, 141 miles long. The Birmingham canals had, according to the Board of Trade returns, 1898, the highest net revenue earned by British canals in that year, £119,193, as against £103,663 earned by the Manchester ship canal; while the third waterway on the list was the Aire and Calder navigation, which, though only 85 miles long, had a net revenue of £92,057, as against £50,642 earned by the Leeds and Liverpool, £48,840 earned by the Grand Junction, £23,613 by the Grand canal, Ireland, and only £1,099 by the Shropshire Union. The Aire and Calder and the Weaver are the two most remunerative of the river navigations of the country, and over 1,000,000 tons of salt, besides a considerable trade with the potteries in coal, timber, cotton, flint and clay are annually carried over the latter river, which has been canalized for 50 miles between Northwich and Chester, and has four large locks 220 feet long by 42 feet 6 inches wide, and having 15 feet of water on the sills.

FINANCIAL POSITION OF BRITISH WATERWAYS AND ITS CAUSES

As will be evident from the above figures a large portion of the inland navigation system of the United Kingdom, on which £14,000,000 had been expended up to 1830, has ceased to be remunerative. No less than 39 out of the 99 waterways of England and Wales were shown by the return of 1898 to be carried on at loss, and of the 126 waterways in the United Kingdom only two earned net incomes exceeding £100,000. Only twelve waterways earned incomes between £10,000 and £100,000, and only fourteen incomes between £1,000 and £10,000. Of the remainder only eleven earned incomes exceeding £500; and, though the impoverished condition of the canal companies and navigation authorities is partly due to the defective and obsolete construction of a majority of the waterways, the number of conflicting authorities by which they are governed and the keen competition between them, it is primarily attributable to the extensive control which the railway companies have acquired over the whole of the inland navigation system.

APPENDIX V

The following information regarding mileage and traffic of the German waterways and railways is taken from a paper on "The Present Significance of German Inland Waterways," by Prof Walther Lotz, of the University of Munich, Germany, and published in The Annals of the American Academy of Political and Social Science, January, 1908.

German navigable waterways, not including river mouths navigable by sea-going ships

	1875	1905
Length .... km..	10,000	10,000
Arrived .... tons..	11,000,000	56,400,000
Departed .... tons..	9,800,000	47,000,000
Net ton kilometers [a]	2,900,000,000	15,000,000,000
Kilometric traffic [b]	290,000	1,500,000
Average distance transported .... km..	280	290

German railroads

	1875	1905
Length .... km..	26,500	54,400
Ton kilometers	10,900,000,000	44,600,000,000
Kilometric traffic	410,000	820,000
Average distance transported .... km..	125	151
Per cent of total traffic:		
Inland waterways	21	25
Railroads	79	75
	100	100

[a] There are three ways in which the statistics of traffic may be presented: The first possibility is to ask how many tons have passed on a certain route. The second, to consider the weight and distance carried, thus arriving at a ton kilometer basis, viz., determining how often one ton has been moved one kilometer on a route. The third possibility is to determine the kilometric traffic. The whole number of kilometric tons is divided by the length of the route, and it is found what part of the entire traffic carried falls upon the average kilometer. This is the best method of comparison where we are interested in what the waterway and railroads actually accomplish for traffic. The above figures from Sympher are to be found in the Zeitschrift für Binnenschiffahrt, 1907, p. 496, *et seq.*

[b] In reckoning average distance transported it is sought to answer the following question: How many kilometers on the average does a ton of freight, once delivered to the waterway or railroad, travel before it reaches its destination?

If it be correct to assume that the length of the navigable waterways remains the same in 1905 as it was in 1875—ten thousand kilometers—the part of waterway traffic in the total traffic (25 as compared with 21 %) has increased more than the per cent of the rail tonnage, although the railways rose from 26,500 to 54,400 kilometers in length.[a]

Kilometric traffic was, if Sympher's estimates are to be trusted, much smaller by water in 1875 than upon the railroads. In 1905 the average traffic on railroads had risen greatly, but that upon the waterways had increased even more, so that it (1,500,000 ton kilometers) exceeded the kilometric traffic of the railroads (820,000 ton kilometers). The kilometric traffic of the German waterways at the present time is greater than that upon the French waterways.[b]

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[a] If the length of German waterways in 1900 be taken as the same as in 1875, their character was markedly improved. Major Kurs, however, reckons the length of the navigable canals and rivers in Germany in 1894 as greater than that given by Sympher, namely 12,223.02 kilometers. Including the navigable inland seas and harbors, etc., Major Kurs counts 14,939.37 kilometers in Germany. See page 10 of the Tabulated Report Concerning the Navigable Waterways and the Waterways for Rafting Timber in the German Empire. (Major Kurs, Berlin, 1894.)

[b] The kilometric traffic on the French inland waterways is given by Sympher for 1905 as 411,000, as compared to 182,000 in 1875.

CONSERVATION OF POWER RESOURCES

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Without disparaging other aspects of our progress, it is not too much to say that our time is preeminently the Age of Power. This applies to the world at large, but especially to the United States. Our population is increasing with unprecedented rapidity, but our mineral production is increasing so much more rapidly that some have called this "the Age of Metal." Steel, copper, and wood are combined in mechanical devices at a rate increasing more rapidly than ore production, so that others have characterized this as the "Age of the Machine;" yet that aspect of modern life which most impresses the student of progress is the increasing use of mechanical power through the development of prime movers and the utilization of new power sources. Rapidly as our population advances, it is outrun by metal production, and that in turn by machine building; yet our most rapid progress—the feature in which our advancement exceeds all others—is in the development and use of Power.

HISTORICAL DIVISION

Historically considered, the utilization of our power resources has undergone three characteristic phases of development.

In the first, power was produced directly by natural forces such as falling water and wind and its use necessarily was limited to those places where these natural forces were found. This led to the early manufacturing establishments of New England grouped about easily available water powers. This might be called the period of water powers, and in this country it held ascendency in the manufacturing industries until about 1870.

The second phase was characterized by the development of the steam engine, which rendered practicable the utilization of the stored energy in fuel as a source of power. During this period the development of coal mines and rapid growth of our railway systems imparted a tremendous stimulus to commercial enterprise. Proximity of water powers was no longer controlling and factories were established at points selected by reason of the availability of raw material, labor, transportation facilities and markets, as well as power supply. As in the first period, however, the power necessarily was used where developed and the size of the plant was limited to the requirements of the individual user.

ELECTRIC POWER [a]

Electrical transmission of power is the new art which now is resulting in another and radical change in methods of utilizing our power resources, permitting, as it does, development whether by water power or by steam at points most convenient and economical, and transmission to the consumer in form adapted to great variety and convenience of use. This new development in applied science calls for reappraisement of the sources from which our power is derived. The size of the power plant is no longer limited to the requirements of the individual user, but the power for entire communities can be supplied from a single station. The enlargement of this field of work newly opened by the electric transmission of power from great distances is now in active and practical development. As a result rapid changes are taking place in the methods of using power. New economies are possible of accomplishment and the resulting effect upon the conservation and utilization of our power resources is of the greatest importance.

FUEL SUPPLY

Where power is developed from the combustion of coal, wood, oil or gas, our natural resources as such are destroyed and they can not be replaced, excepting to a limited extent in the case of wood and similar products. The supply of natural oil and gas is limited and uncertain and the amount available is required for special industries. The coal production of the United States for the year 1906 was 414,157,278 tons; for 1907, about 450,000,000 tons. If the production of anthracite coal is continued at only its present annual rate, the supply will be exhausted in 60 to 70 years. Since the beginning of our coal industry the production has doubled approximately every ten years. Assuming that this rate of increase can not be maintained, but will become constant in about 150 years, it is estimated that the supply of bituminous coal will be exhausted in approximately 700 years.[b] But that the coal production should become constant even 150 years hence implies that our industries must become stationary, unless other power resources are found. We can not look forward to such a condition with equanimity. Without coal our domestic and industrial life are inconceivable, and our existence in great cities and crowded communities is impossible unless a substitute is devised. The future welfare of the nation requires that all practicable means be employed for the conservation of the supply of coal.

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[a] Electricity, of course, is not a source of power—it is simply the agent by which energy developed from fuel and water is transmitted to the mechanism which utilizes it. In speaking of electric power, therefore, it must be borne in mind that such power is always produced primarily by water wheels, turbines, steam engines, or gas engines. With reference to their source, therefore, we have only water power and fuel power to consider, but with reference to application it is convenient and instructive to compare water power, steam power and electric power; the two former being applied directly through mechanical means to the work, while the last named has its origin in one or the other of the former and is applied through motors.

[b] "How long will our coal supplies meet the increasing demand of commerce?" by Edward W. Parker, U. S. Geological Survey. Presented to the American Society of Mechanical Engineers, 1907.

AVAILABLE WATER POWERS

Where power is derived from water, winds, and tides, only energy otherwise wasted is used. The energy thus extracted is added to our assets instead of being a permanent loss as is the case with the combustion of coal. It is now feasible and practicable to develop water powers, wherever located, for electric power. In the aggregate the available water powers of the nation greatly exceed the present power requirements, but unless there is some curtailment in the rate of our devlopment our water power resources, while being of great magnitude, will not of themselves solve the problem of our future supply of power. The amount of water power available in the United States is not known. Some partial estimates have been made, but these are necessarily approximate, as exact figures can be obtained only after careful survey and study not only of the existing physical conditions, water flow, and available reservoir capacity, but of the practicable auxiliary steam power that can be profitably installed. The power of Niagara has been estimated by Professor W. C. Unwin at 7,000,000 horsepower. A partial estimate of the water powers of the upper Mississippi river and tributaries places the available water power at about 2,000,000 horsepower. The southern Appalachian regions can furnish a minimum of nearly 3,000,000 horsepower.[a] Both of these estimates can be greatly increased by including the use of regulation reservoirs and auxiliary steam plants. The water powers of New England are more fully developed than elsewhere in the country, though much remains yet to be done. In the Rocky mountains and the far West there are immense water power possibilities; in the State of Washington alone there are 3,000,000 horsepower available;[b] and Governor Pardee estimates that the streams of northern California are capable of producing 5,000,000 horsepower. Even approximate data upon which to base an estimate of the total amount of available water power in the country is lacking, though a good start in its collection has been made by the Geological Survey with the limited means at their disposal. It is probable that the water power in the United States exceeds 30,000,000 horsepower, and under certain assumptions as to storage reservoirs this amount can be increased to 150,000,000 horsepower or possibly more. Much depends upon whether regulation reservoirs and reserve steam plants are included in the estimate. Both have been demonstrated to be practicable and undoubtedly should be considered in any estimate made of the available water power resources of the country.

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[a] "Water Powers of the Upper Mississippi and Tributaries," and "Water Powers of the Southern Appalachian System," by M. O. Leighton, Chief Hydrographer, U. S. Geological Survey.

[b] Computed by F. G. Moorhead, in The World's Work, April, 1908, p. 10091.

Using the smaller figure of 30,000,000 horsepower as an illustration, to develop an equal amount of energy in our most modern steam-electric plants would require the burning of nearly 225,000,000 tons of coal per annum, and in the average steam-engine plant, as now existing, more than 650,000,000 tons of coal, or 50% in excess of the total coal production of the country in 1906. At an average price of $3.00 per ton it would require the consumption of coal costing $2,000,000,000 to produce an equivalent power in steam plants of the present general type.

The supply of water power is limited, however, when the rapid rate of increase in our power requirements is considered, and great care, therefore, must be exercised to insure the preservation of our water power resources and to secure the maximum practicable development.

TOTAL POWER USED IN UNITED STATES

Using the data furnished by the census returns of 1900, 1902, and 1905 as a basis and applying the prevailing rate of increase in the industries included in these reports, and adding an equivalent amount for the steam railroads, it is estimated that the total installed capacity of prime movers in all our land industries for the year 1908 approximates 30,000,000 horsepower (figure 1).[a]

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[a] The following table compiled from the latest census returns gives the installed capacity of prime movers in the United States in the industries named at the dates mentioned:

	Installed horsepower
Manufactures, census 1905	12, 765, 594
Mines and quarries, census 1902	2, 753, 555
Street railways, census 1902	1, 359, 289
Electric light and power stations, census 1902	1, 845, 048
Telephones, telegraph and fire alarm systems, census 1902	3, 148
Custom flour, grist and saw mills, census 1900 (omitted from census 1905)	883, 685
Steam railroads (data from Statistics of Railways, 1905), equivalent power	3, 750, 000

These figures include prime movers only. Duplications in the way of electric, water and air motors and rented power have been omitted. The equivalent power used by the steam railroads is based upon the result of calculations made by Lewis B. Stillwell and H. St. Clair Putnam in a paper presented by them to the American Institute of Electrical Engineers, January, 1907, "On the Substitution of the Electric Motor for the Steam Locomotive," and represents the installed power-house capacity required for their electric operation in the year 1905. Based upon maximum drawbar pull, the power of the 46,743 steam locomotives in the United States (1904) averages 600 horsepower (census 1905) but the power developed when averaged over the entire year approximates only 40 horsepower. In order, therefore, that the estimate of total power in the United States should not be misleading the power used

The average load on steam and other engines is much less than their rated capacity and, owing to the overlapping of loads, it is probable that the total average load does not exceed one-third or one-quarter of this amount.

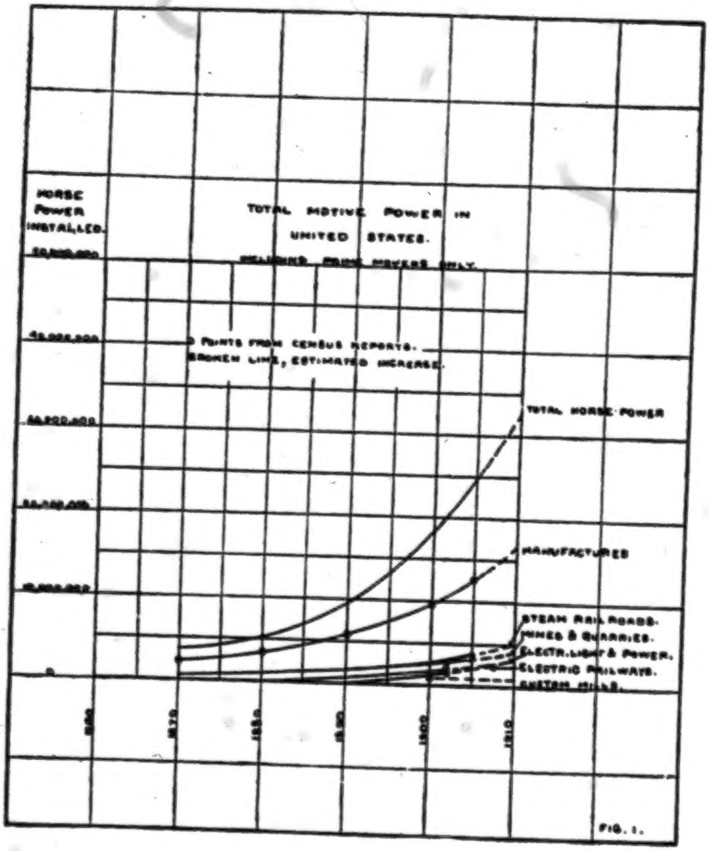

FIG. 1.

RATE OF INCREASE

During the past thirty years the total amount of power used in our manufactories and other industries, as recorded by the census, has doubled approximately every ten years. The fact that substantially

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by our steam railways has been taken at a figure that is comparable with the installed power in other industries as, for example, in electric railways where the installed capacity in the power houses has been taken rather than the rated power of the motor equipment which is many times greater than the power-house capacity required for their operation.

the same rate of increase has existed in coal production, railroad gross earnings, freight ton-mileage, passenger mileage and the value of agricultural products as well as in total power consumption is a striking demonstration of the close interrelation and mutual dependence of these great factors which, in the aggregate, measure the industrial progress of the nation. Yet the records of power used in small units are far from complete.

We can not foretell how long the present rate of increase in our industrial enterprises will continue. This will be determined by the general laws which govern industrial development and by the increase in wealth. It is clear, however, that if our power resources are exhausted or wasted the result will be disastrous.

RELATIVE USE OF STEAM, WATER POWER, ETC.

Of the total estimated power at present produced by prime movers, about 26,000,000 horsepower is produced by steam engines, 3,000,000 horsepower by water motors and 800,000 horsepower by gas and oil engines (figure 2). These figures emphasize the present position of the steam engine in our industrial development and the relatively much less important place now occupied by water power.

GROWTH OF ELECTRICALLY APPLIED POWER

Of the total 30,000,000 horsepower, including the railroads, used in the country, it is estimated that 9,000,000 horsepower, or 30%, is now utilized electrically (figure 3).[a] This highly remarkable growth has been accomplished in 25 years. The use of electric power at the present time is being doubled approximately every five years, as contrasted with the phenomenal doubling of the total power every ten years. If the present rate of increase is maintained, electrically applied power will equal or exceed the power mechanically applied in 1920. This great growth is due to the convenience, earning capacity, and economy resulting from the use of electrically applied power. The significance of this remarkable increase in the use of electric power in manufactures and other industries lies in the market thus provided for the utilization of our water powers wherever located and whatever their magnitude.

ECONOMIES DUE TO ELECTRIC POWER: STEAM POWER

Where coal is the source of power, electric transmission and distribution greatly reduce the amount burned to perform given mechanical work. This results from the substitution of a few large and highly efficient boilers and engines for a larger number of relatively small and uneconomical ones and from the introduction of plant economies and skill in operation not attainable in the smaller plants. A material saving is effected also in the application of the power directly to the work through motors instead of indirectly through inefficient countershafting and belting.

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[a] This does not include the electric power generated in isolated plants and used for other purposes than manufacturing. These plants are not included in the census reports, and while they are individually small the aggregate electric power developed is large.

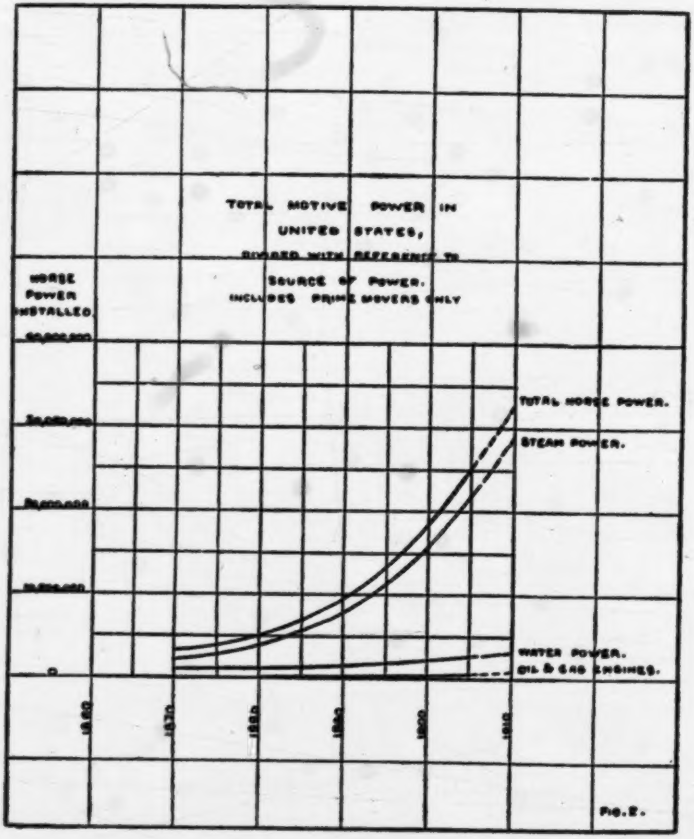

FIG. 2.

A further material gain also results from the fact that a large plant carrying the load formerly carried, for example, by one hundred small plants is operated under conditions more nearly approximating uniformity of load and therefore at higher economy.

Greater economy can be obtained, even in our large plants, through the more general use of so-called fuel economizers, superheated steam, higher vacuum and better combustion under the boilers. We may expect still higher efficiency from the development of larger boiler and engine units. These economizing appliances, which are relatively unimportant in small plants, become of great importance in large plants, and will have still greater influence on steam practice as the price of fuel increases and the cost of capital decreases.

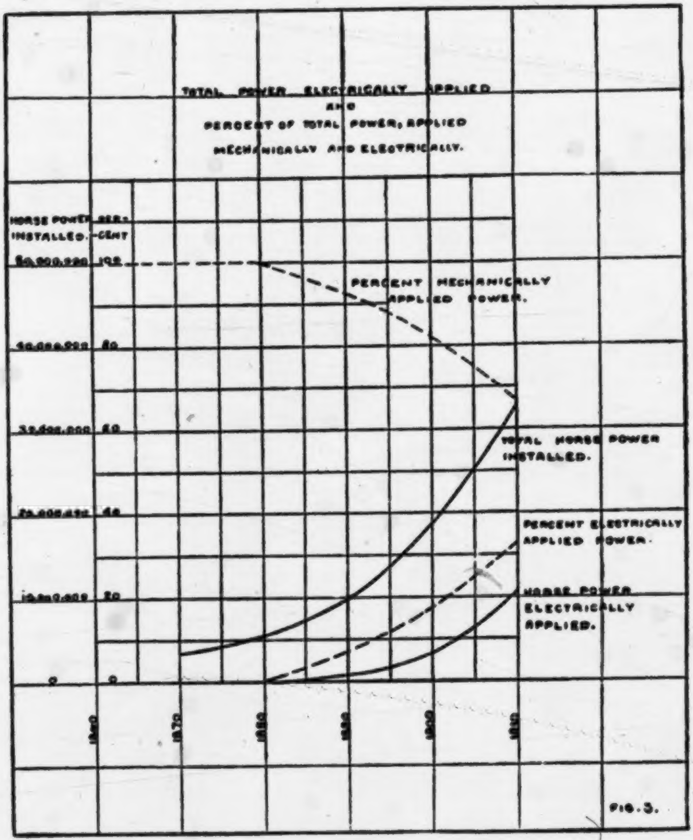

FIG. 3.

FUEL ECONOMY OF GAS ENGINES

This discussion would be incomplete without mention of the great possible fuel economy that may result from the use of gas and other similar engines. Though engines of this character antedate the use of the electric motor their development has been slow, and they occupy a relatively unimportant place as power producers. The ordinary steam engine utilizes not more than 4 or 5% of the heat energy in coal, and our best modern steam-electric plants show a heat efficiency not exceeding 10 or 12%.[a] With the gas engine and producer gas the heat efficiency can be more than doubled, and still higher efficiency seems probable with higher compression or through the use of other possible improvements.[b] This is a most promising field for development and it is entirely possible that the gas engine may revolutionize our methods of using fuel for the production of power.

Beyond these gains, which may be considered well within the limits of possible attainment by present knowledge, there stands the theoretical prospect of still greater economies, the possibility of which can not be denied so long as methods employed in developing energy from coal results in a waste of from 75 to 95% of the potential energy which nature has stored in the coal. But the science of the present time does not permit us to assume any radical increase in efficiency of fuel engines beyond the limits which I have indicated and our only safe course is to base our estimate upon the progress of the present time with such reasonable allowance for improved economy as is dictated by recognition of progress of the art along lines now within the horizon of possible science.

WATER POWER ECONOMIES

Where water power is the source of supply, electricity promotes economy for reasons identical with the foregoing, except that absence of fluctuation of load is relatively less important, but the great gain which results from electric transmission is the utilization of water powers remote from power markets. Where several water powers along a stream are developed it becomes possible to utilize, in conjunction with the larger and more cheaply developed powers, others which, considered independently, could not be utilized to advantage.

APPLICATIONS OF ELECTRIC POWER: MANUFACTURES

Prior to 1870 the use of water power in manufactures exceeded that of steam power. Water power expressed in percentage of the total power employed has since steadily declined, falling from 48.3% in 1870 to 11.2% in 1905 (figure 4). During the corresponding period steam power increased from 51.8% in 1870 to 78.2% in 1900. The census of 1900 showed a marked falling off in the rate of increase in the percentage of steam power used as compared with the rate prior to 1890, and this was accentuated in the census of 1905, when the percentage of steam power fell to 73.6% of the total. This check to the ascendency of directly applied steam power was due to the introduction of electric power. In 1890 electric power was negligible. In 1900 it constituted 4.8% of the total. In 1905 this had increased to 11.8%—a marvelously rapid growth when the aggregate increase of over 1,000,000 horsepower in five years is considered. If the present rate of increase prevails until 1910, electric power will have reached 18% of the total and steam power will have dropped to 68%. If the same rate of increase is maintained until 1930, electric power as applied to the manufacturing industries will exceed the amount of steam power applied direct.

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[a] "Power Plant Economics," by Henry G. Stott, presented to the American Institute of Electrical Engineers, January, 1906.

[b] Report of F. W. Burstall to the Gas Engine Research Committee of the (British) Institution of Mechanical Engineers.

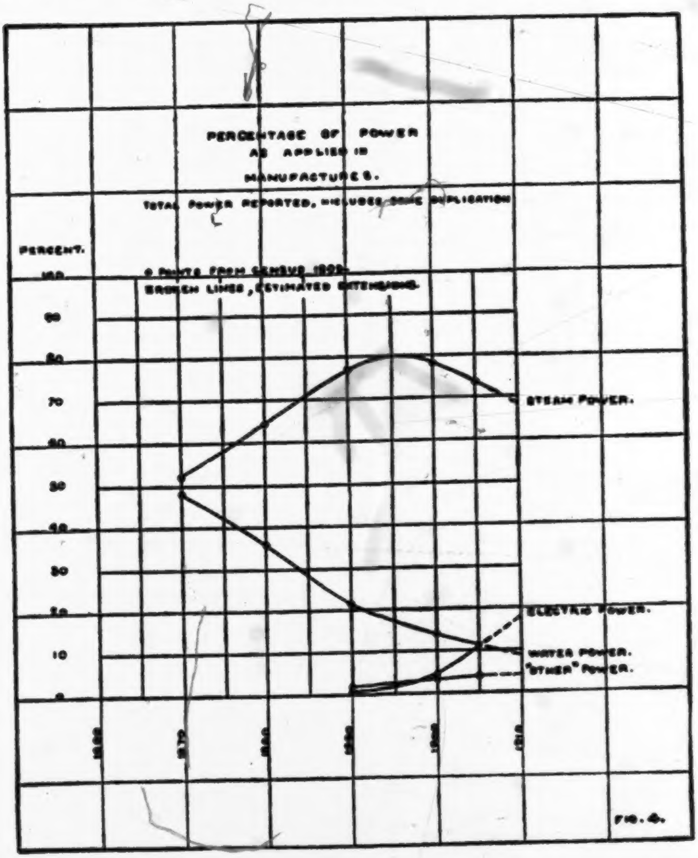

FIG. 4.

OTHER INDUSTRIES

The tendencies illustrated by the changes that have taken place in the methods of utilizing power in manufacturing apply generally to other industries. The increasing use of power is phenomenal; the steam engine as a source of power is thus far paramount in them all, but the percentage of electrically applied power is increasing at nearly double the rate of increase of the total power used.

ELECTRIC LIGHTING

The extraordinary growth of the electric lighting industry is familiar to all. Unfortunately the results of the special census of 1907 are not yet available, but the indications are that the five years that have elapsed since the previous census will show phenomenal growth. During these five years the gross sales of the great electric manufacturing companies have doubled, and the proportion of the output consisting of electric power apparatus and generating units of large size has greatly increased. An influential factor in the growth during this period has been the rapid development of long-distance hydro-electric power transmission plants.

ELECTRIC RAILWAYS

Since the displacement of horse and cable cars in the cities a few years ago, electric railways have been extended to suburban and interurban districts and are rapidly forming a net work over the entire thickly settled portions of the country. In the nature of their traffic many of these roads are scarcely distinguishable from steam railroads, and many railroads are using them as feeders. In a few cases railroads have converted steam-operated branches into electric lines.

ELECTRIFICATION OF STEAM RAILROADS

A beginning is being made in the electrification of our steam railroads. The New York Central, the Pennsylvania, the Long Island, the New York, New Haven & Hartford, the Grand Trunk, the Northern Pacific, the Erie, the Southern Pacific and others have electrified portions of their lines, and most of these are now in successful operation. Many of these roads are extending the electric zone. Thus far most of this work has been induced by terminal requirements, tunnels, heavy grades or other special conditions which emphasize the advantages to be derived from electric operation. The increase in capacity, convenience and greater earning power as well as the economies resulting from electric operation will stimulate the electrification of steam railroads, just as these factors have stimulated the use of electric power in other industries. The problem presented is larger because of the necessity of interchangeability of equipment, and the development must necessarily be gradual on account of the magnitude of the interests and the large capital expenditures involved. The railroads are among the largest consumers of fuel; and electric operation, exclusive of the use of water powers, would reduce the coal consumption to less than one-half of that required for similar operation with steam locomotives.[a]

TENDENCY TOWARD GREATER USE OF WATER POWERS

During the past few years there has been renewed interest in water powers on account of the practicability of their use for the generation of power and the electrical transmission of this power to distant markets. The great hydro-electric development at Niagara was the first large enterprise of this character and has demonstrated its practicability. The census of 1905 gives a partial list of long-distance hydro-electric plants developing power aggregating 600,000 horsepower and this list can now be largely increased. Our most desirable water powers are being absorbed rapidly, and it becomes important, therefore, for us to take stock of our water resources and formulate plans for their control and proper utilization.

INLAND WATERWAYS

In the improvements that have been made on navigable rivers, too little attention has been given to the development of the incidental water powers. On some waterways, as in several instances on the Mississippi, immense sums of money have been appropriated and expended on especially difficult portions of the river. If this money could have been made available in large amounts, instead of by driblets over periods of many years, water powers of great value could have been developed and the navigation effectively and permanently improved. Unfortunately this has not been our policy. Too often the appropriations have been inadequte for carrying out the work as it should be done and frequently the work has not followed any well-digested plan.

With the data at hand, it is impossible to make an accurate estimate of the amount of power that can be developed incidentally to river navigation. A partial estimate of the power developed at existing government locks and dams places the amount at 1,600,000 horsepower.[b] This is based on the mean low-water discharge for three months. This subject should receive careful consideration. Improvements in navigation should be made only after thorough study of the possibilities of power development. On the other hand, many water powers are on streams that are navigable, or are capable of canalization, and these streams should be developed for power purposes only after careful examination has been made of the possibilities of the stream forming a link in the system of inland waterways.

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[a] "On the Substitution of the Electric Motor for the Steam Locomotive," by Lewis B. Stillwell and H. St. Clair Putnam, presented to the American Institute of Electrical Engineers, January, 1907.

[b] "Available Water Powers of the United States Government Locks and Dams," collected by M. O. Leighton, United States Geological Survey.

CANALIZED RIVERS

There are many streams that are not now navigable, or are navigable for only a portion of the season, that can be canalized and converted into streams of great commercial value. The use of our waterways for both power development and navigation causes no conflict; these uses are in fact corelated and their interests harmonious. Where it is necessary to place a dam across a stream to develop power, the slack water so produced, with the addition of locks, renders otherwise impassable stretches of river available for navigation. Every water power development is vitally interested in obtaining a uniform flow of water. This exactly meets the requirements of navigation. The approximate realization of regularity of flow can be attained only by the construction of headwater regulating reservoirs and the preservation of our forests. Every water course that is improved for the production of power and for navigation produces, therefore, vigorous self-interested allies in the cause of forest preservation, headwater regulation and the maintenance of conditions which are favorable to both interests.

CANALS

Considerations which affect the use of our rivers and streams, as sources of power and for navigation, apply also to canals. Heretofore, canals built for transportation purposes have not been used, to any great extent, for the development of power. In some cases this has been on account of the limited supply of water, but more frequently it has been due to the great difficulty experienced by the animals in towing boats against the rapid current produced in the canal by the flow of water to the water wheels. In recent tests it has been demonstrated that canal boats can be towed by electric towing machines at a much lower operating cost than is possible with animals and that operated in this manner the speed can be greatly increased.[a] The first cost of electric equipment is relatively large but the change to electric towing will pay handsomely when the volume of traffic is sufficiently large. The traffic required is well within the ultimate capacity of the canal. With electric towing the increase in the rate of current flow introduced by the development of water power on the canal is not a serious impediment to navigation.

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[a] "Notes on Electric Haulage of Canal Boats," by Lewis B. Stillwell and H. St. Clair Putnam, presented to the American Institute of Electrical Engineers, March, 1908.

IRRIGATION

There are large areas in the Western States where the soil is of wonderful fertility but irrigation is essential to the successful growing of crops. The cultivated lands usually lie in valleys and water is carried to them through long and oftentimes wasteful irrigation ditches. In many cases the water could be utilized for developing power on the headwaters of the streams without injury to the irrigation interests, as is illustrated by the excellent work now being done by the Reclamation Service. The development of water power will introduce another party whose self-interest dictates the use of every available method of preserving the volume of water supply, its continuity and regularity of flow.

In some cases irrigation channels can be converted into canals suitable for at least limited navigation, and where practicable this should be done. Some types of apparatus as now developed for towing canal boats by electricity require but little space along the side of the ditch and can be installed, usually, without additional grading wherever an irrigation ditch can be constructed. Electric towing can not be economically practicable, however, unless the traffic reaches a considerable volume. With animal power the additional capital investment is small and is proportional to the amount of business handled. With electric towing the first cost is large and manifestly sufficient traffic must be secured to meet the capital charges before profits can be realized.

WATER SUPPLY

What has been said upon the subject of irrigation canals applies to the development of the water supply for our cities. This work, like irrigation, should be carried out so as to develop the maximum water power possible without injury to the water supply.

The preservation of the purity of water for domestic use is of great importance to the welfare of the nation. A consideration of this subject, as well as of navigable waterways, canals, irrigation and water powers, emphasizes the absolute necessity of competent supervision of the natural water resources of the country.

REGULATION OF STREAM FLOW

The flow of water in many streams annually fluctuates between wide limits. The low-water periods limit the profitable water power development and the high periods often cause disastrous floods. On most streams the average rate of flow for the year is many times the minimum flow. It is possible in some cases to utilize a flow approximating the average by constructing controlling reservoirs on the headwaters of the streams. Our Great Lakes form a natural reservoir of this character for the Niagara River. The upper Mississippi has great natural reservoirs which assist in regulating its flow and which easily can be made very effective in its control. The notable floods of the Ohio River can be greatly reduced by the construction of controlling reservoirs on its headwaters which will result in the saving of millions of dollars now annually destroyed. On a stream which I recently investigated the minimum flow furnishes but 200 horsepower. The construction of a storage reservoir increases the continuous 24-hour power that can be utilized to 8,000 horsepower. If storage reservoirs could be constructed on the Susquehanna river, upon which a great water power development is now in course of construction, so as to obtain a uniform flow throughout the year, the available power at this site would be increased from a minimum of 30,000 horsepower to 200,000 horsepower. While it is impracticable to construct reservoirs capable of holding back all flood waters, it is nevertheless certain that material gain would result from well-directed efforts along the lines suggested.

AUXILIARY STEAM PLANTS

On account of the great annual fluctuations now existing in stream flow it has been found profitable to install steam plants supplementing the water power during seasons of low water. This method on account of its expense greatly handicaps the full development of our water powers and increases the amount that must be charged for the power. Under given conditions the most profitable amount of water power to develop and the best size of steam plant to install can be determined with great accuracy. The reserve steam station need not be located at the water power; in fact, it preferably should be located at or near the market for the power when that is distant, as greater reliability and continuity of power supply is thus secured. Headwater regulation would greatly reduce the necessity for such auxiliary steam plants.

Similarly the water power which can be purchased economically by a prospective customer who already has a steam plant in operation can be accurately determined. This amount depends upon the relative cost of generating different portions of the load by steam as compared with the amount charged for the water power supplied. In its economical application this method of operation works out so that the water power plant carries the steady portion of the load where the coal consumption per horsepower capacity is greatest, and the steam plant is called upon to carry the peaks only where the coal consumption per horsepower is least.

INTER-CONNECTED PLANTS

In addition to their reserve function in time of low water or flood, auxiliary steam plants and inter-connected plants are valuable as insuring the continuity of power supply. If the lines are run overhead, as they must be for long-distance transmission in the present development of the art, all electric transmission plants are subject to occasional short interruptions due to storm, lightning, or malicious mischief. It is economical and desirable to tie together two or more plants, thus greatly increasing the reliability of service. If one plant or transmission line fails, the others can be pushed to take the load. From an engineering standpoint, and from the standpoint of the engineer as well as the power producer, this method of operation has great advantages.

IMPORTANCE OF POWER RESOURCES

In 1905 the value of the product of our manufactures amounted to $16,866,706,985; the total receipts of the steam railroads were $2,325,765,167.

In manufacturing the value of the product was $1,152 for each horsepower installed and the yearly wages amounted to $248 per horsepower.

In the railroad industry the gross receipts amounted to $555 and the yearly wages to $224 per horsepower, rated on a basis comparable to that used in the census report covering manufactures.

I have selected these two classes of industry for the reason that they use the bulk of the power and illustrate its tremendous productiveness in increasing our wealth.

On the basis of the lower estimate of water power already mentioned, namely, 30,000,000 horsepower, and applying the ratio which now exists between wages paid and power utilized in manufacturing and railroad industries, the development of this amount of water power implies an increase in wages paid amounting to about $15,000,000,000 per annum, an amount more than double the total value of our agricultural products at the present time.

These figures emphasize the vast financial importance of our power resources and the necessity of their conservation and their intelligent development. Much can be accomplished by the National Government in connection with irrigation of national lands and the improvement and preservation of navigable waters. The State governments can greatly assist in this work, within their respective territories.

CENSUS OF WATER RESOURCES

A reliable census of water resources is greatly needed. The Geological Survey has accomplished much in measuring and recording the flow of streams, but the work done is small as compared with that which remains to be done. Obviously, in order that records of this character shall constitute a uniform and safe basis for the very large capital investment which must be made in the future in order that our water power resources shall be properly utilized and our fuel supplies conserved, they should be made under the immediate direction of the National Government.

RESEARCH WORK

The National Government can render great assistance also in the research work which it has undertaken into the better utilization of our fuels. Excellent results have been obtained by the able body of engineers engaged on this work, but when we consider that we are now utilizing but five or ten per cent of the heat value in fuels it is evident that much remains to be done.

NECESSITY OF GOVERNMENT REGULATION

Power and transportation are the two great physical bases upon which modern industrial development rests. Without power our methods of transportation must revert to a level with those existing in China. Up to the present time while Nation and States have regulated and in some degree aided in the development of transportation, the power resources of the country have been utilized or wasted by the private individual and the corporation with little hindrance and still less regulation by the constituted authorities. Next to individual enterprise, the most essential factor in the development of our national resources is wise governmental guidance so applied as to insure the vigorous working of individual initiative, and at the same time prevent the waste by individuals of that which is vital to our national welfare and to secure in the utilization of our national resources the highest practicable degree of economy which scientific knowledge and engineering skill can attain.

ADDITIONAL EXPRESSIONS

CONSERVATION OF NATURAL RESOURCES IN ILLINOIS

CHARLES S. DENEEN

GOVERNOR OF ILLINOIS

The idea of cooperation between the States in the preservation and the development of natural resources appeals strongly to Illinois. Centrally located and therefore sensitive to whatever affects the prosperity of other parts of the country, Illinois is interested in their welfare, not only as a great commercial Commonwealth but also as a sharer in those natural advantages which have in the past proven the mainstay to our national prosperity. In mineral resources and in soil fertility; in the abundance of advantages related to the dawning era of American domestic waterway development, Illinois is second to no State in the Union.

I am proud, therefore, as an Illinoisan to say that the new spirit of Conservation—the spirit which animated the President in calling together this Conference—has been in recent years dominant in the administration of public affairs in Illinois. It was in this spirit that, in 1905, the Illinois General Assembly enacted a law creating a State Geological Survey Commission, with the duty of making a complete investigation and study of the geology and of the mineral resources of the State with a view to their efficient and economical development.

The mineral resources of Illinois are of great variety. Besides coal, they include clays suitable for many manufacturing purposes, as fire clays, brick clays, tile and porcelain clays; sands for glass-making, for building purposes, for mortar, for braziers' use, etc.; fluorspar; zinc, lead, and cement products. Illinois leads all other States in the production of limestone for building purposes, as well as in the production of petroleum. Our State also has an extensive natural gas area.

In 1906 the total value of the mineral output of our State was $121,000,000. For 1907 the preliminary figures indicate that the total output was approximately $143,000,000.

The Geological Survey Commission is now engaged in the mapping and study of the newly discovered oil fields of Illinois, which last year produced nearly 25,000,000 barrels of oil. Prior to the studies now being conducted by the Commission, very little data was obtainable in regard to the probable oil area of our State. With such meager data as were procurable, however, the Commission was able in its first report on the oil district to point out the direction of future development.

Another branch of the work of the Geological Survey Commission is the study of the various rivers, and of adjacent lands subject to overflow, with a view to stream improvement for reclamation and, incidentally, for navigation and water-power purposes.

In this work the Commission cooperates with a State Commission created in 1905 for the study of similar problems. This Commission, the Illinois Internal Improvement Commission, was appointed under an Act passed at the session of the General Assembly in 1905. The Act provides that the Commission "shall investigate the various problems associated with a projected deep waterway from Lake Michigan to the Gulf of Mexico, and the reclamation of lands subject to overflow or inundation."

The report of the Commission dealt largely with the question of the feasibility of establishing water communication between the Great Lakes and Mississippi river. Prior to the appointment of this State Commission, an appropriation of $200,000 had been made by the Federal Government in the River and Harbor Act of 1902, "for making such surveys, examinations and investigations as may be required to determine the feasibility of and prepare plans and estimates of the cost of a navigable waterway fourteen feet in depth from Lockport, Illinois, to St. Louis, Missouri." The report of the committees appointed by the Federal Government to make these investigations showed the entire feasibility of the project, and estimated its cost at $30,097,462. The report of the Internal Improvement Commission agreed with that of the Federal Government and further pointed out that "with the large flow of water proposed, there can be developed between Lockport and Utica (a distance of 61½ miles) 173,000 available electrical horsepower".

The possibility of water-power development became at once a subject of the greatest interest to the people of Illinois in connection with the discussion of the proposed waterway construction. The possibility thus afforded of securing, at the same time, a waterway of the highest commercial value and a perpetual source of income from water-power development amounting to $2,750,000 annually, led to the submission to the voters of Illinois on November 3, 1908, of an amendment to the Constitution of the State permitting the issuance of $20,000,000 in bonds to cover the cost of waterway construction and water-power development between Lockport and Utica.

In addition to the water power to be developed by the State, there is also under development by the Sanitary District of Chicago water power whose value is estimated at about one-third of that of the State water power, making the total value of power to be developed in Illinois $3,500,000 annually.

Viewed purely as a waterway proposition, however, the development of the navigable streams of the State is a matter which is second to none in importance now confronting the people of Illinois. The physical characteristics of the State lend themselves readily to such development. It has been ascertained by engineers who have made a study of the subject that no less than 2,000 miles of navigable waterways in the form of barge canals can be added to the present system, by canalizing certain of our rivers and making the necessary connections, at a cost comparatively trifling in view of the enormous benefits thereby conferred upon the industries of the State.

Illinois has the lowest altitude of any of the central States of the Mississippi valley. The great water courses of the continental interior, therefore, naturally flow toward it, giving it a deep and special interest in the general problem of American domestic water development which is shared by all parts of the country. The State is also the most uniform in topography in this great central area. Its domestic water courses are, therefore, peculiarly susceptible of unification. In their former natural state, the ancient heads of navigation on some of the Illinois streams were much above where they are found to-day. On Little Wabash river, the head of navigation was at Carmi; on the Big Muddy, at Murphysboro; on the Kaskaskia, at Vandalia; on the Sangamon, at Petersburg. The development of railroad transportation resulted in the abondonment of these streams as arteries of commerce and in the complete neglect of efforts to maintain their navigability. Reports of Illinois engineers, however, show that their navigability can be restored. The restoration would extend this cheapest form of transportation to a very large part of the coal area of the State, and afford to this product an outlet by water to the Lakes, the Mississippi, and the Gulf.

In addition to its waterway advantages, the low elevation and uniform topography of Illinois afford other advantages. Its lowness of altitude with respect to the interior of the continent has made Illinois the depository of the alluvial riches of the continent. All the spoils of the lands of the Mississippi valley naturally gravitated in the formative period of the continent from the glacial grindings of the north and form the detritus of the mountain chains, giving to Illinois a greater uniformity and excellence of soil resources than those possessed by any other State.

No estimate of the benefits to flow from stream development would be complete without allusion to the fisheries which have been established on Illinois streams, especially on Illinois river. The fisheries located on this stream stand next in value to those of Columbia river, and the Illinois Fish Commission is pursuing the policy of stocking systematically all the waters of the State. Our experience thus far indicates that the food resources of the water may be brought up in value to those of the land. The Illinois valley alone contains 80,000 acres of water area and yields a fish product worth $10 per acre per annum, very nearly all profit. The average value of the land product is $11.98 and the labor cost of its production was much greater than that involved in our fisheries.

Besides the commissions which are engaged in the investigation of the mineral and waterway resources of the State, Illinois maintains, in connection with the State University, an Agricultural Experiment Station which conducts original investigations into the various phases of agriculture. It investigates the qualities of soils; the leading crops, corn, wheat, oats and hay; orchard fruits; dairy husbandry; live stock, etc. As a result of its investigations, the fertility of large areas in different portions of the State has been greatly increased. This has been notably the case in southern Illinois, where, in 23 counties, the fertility of 6,000,000 acres of land was diminished by the acidity of the soil. Through investigations conducted by the Experiment Station it was found that the application of limestone dust corrected the acidity, and paved the way for a restoration of the fertility of the soil. Stone-crushing plants, previously installed at the State penitentiaries, are now engaged in the manufacture of limestone dust which is being furnished at a nominal price to farmers. Eventually the restoration of this immense area to its normal productiveness is assured, constituting another triumph of the application of science to agriculture.

In many other directions the work of the Experiment Station has been of great importance in the preservation, restoration or development of the agricultural resources of the State. I shall not speak of these, however, because they have been presented by those who have special charge of the work of that character.

One other commission, whose work I shall have time merely to allude to, is the State Highway Commission, which is conducting an important work in the improvement of public highways. Illinois has 94,000 miles of public roads, of which less than 8 percent are macadam or gravel road. For the maintenance of roads and bridges the road districts pay out annually $5,000,000. The expenditure of this large sum has been heretofore confined to local road officials, very few of whom have possessed any special knowledge of road or bridge construction. As a consequence the improvements effected have been far below what could have been accomplished with the same expenditure under a better system of highway improvement.

From the great preponderance of earth roads in Illinois, the proper methods of maintaining this character of road have been especially dealt with and were first taken up. One hundred thousand bulletins have been issued by the Commission on the use of the earth-road drag, and while two years ago not more than 400 road drags were in use on Illinois highways, the Commission estimates that not less than 15,000 have been put in use and considerably more than that number of miles of road have been thus maintained during the past season.

The State Highway Commission supplies what was lacking under the old system, a central bureau of information collected from all over the State as to the best means of road improvement adapted to different localities. The information gathered by the Commission has been given wide publicity through the publication of bulletins, and its purpose has been explained at farmers' institutes and other meetings to which speakers have been furnished by the Commission. By this means great interest has been aroused throughout the State in the subject of road improvement. Experimental roads have been constructed at local expense in various localities. Bridges of concrete and steel construction, designed on plans furnished by the Commission on application by the local authorities, are replacing the old-fashioned wooden bridges.

Perhaps the feature of greatest benefit in connection with the conservation and development of natural resources is found in the joint development of all collateral utilities. To illustrate: It is probably true that the greatest of our natural resources to be conserved lie along our valleys. The question of waterway development, therefore, becomes not solely a question of producing a waterway, but of the development in conjunction therewith of such collateral utilities as water power, land reclamation, fisheries, the improvement of health conditions, the extension of industrial areas, etc. The value of these collateral utilities is more than sufficient to pay for the development of the waterway itself, the direct object of attainment. This is particularly true in Illinois. It has been estimated that in connection with the development of the waterway between Chicago and St. Louis, a distance of 367 miles, the collateral utilities would be worth over $300,000,000, or nearly $1,000,000 per mile of waterway construction. It is evident, therefore, that in the development of a general waterway system under a policy of conservation it will be wise as well as economical to develop these utilities jointly, especially as any attempt to develop the waterways alone, ignoring the collateral benefits, would result in blighting a large source of wealth.

The above consideration leads to the thought that, as these collateral benefits are essentially local, there should be a large measure of cooperation between the States and the Federal Government, and that States and localities should contribute to the general program in some proportion to their exceptional advantages.

This is the view which Illinois has entertained. Enjoying large advantages, she has already made a large contribution to the common cause and, in my judgment, she will after November 3 next be prepared to contribute her full share to the developments of the future.

CONSERVATION OF NATURAL RESOURCES IN THE STATE OF NEW YORK

CHARLES E. HUGHES

GOVERNOR OF NEW YORK

The wise and patriotic summons of the President to the consideration of necessary steps for the conservation of our natural resources met with a cordial response from the People of the State of New York. The Empire State has been bountifully blessed by nature, and for a long period there has been a steady growth in the appreciation of her priceless treasures and of the importance of preserving them. Our vast stretches of forests, feeding our streams and nourishing the agricultural and industrial activities of our citizens, long remained the subject of selfish devastation in reckless disregard of the just demands of future generations and without thought of the essential conditions of our continued prosperity. That sagacious statesman, De Witt Clinton, foresaw the results of careless waste of nature's bounty, and of the wanton sacrifice of our capital thoughtlessly supposed to be inexhaustible, in the satisfaction of the demands of the moment. In addressing the Legislature in 1822, he said:

> Our forests are falling rapidly before the progress of settlement, and a scarcity of wood for fuel, ship and house building, and other useful purposes, is already felt in the increasing prices of that indispensable article. No system of plantation for the production of trees, and no system of economy for their preservation has been adopted, and probably none will be, until severe privations are experienced.

From time to time public-spirited citizens and far-seeing statesmen called attention to the need of a system of conservation, but it is only in a recent period that measures of protection were adopted. Not only did the State fail to acquire and hold from spoliation our forest tracts, but lands which had passed into the control of the State were recklessly disposed of at nominal prices, and are now, under a new policy, the subject of re-acquisition at greatly increased cost. It may be of value briefly to review the experience of the State during the past twenty-five years. Governor Cleveland in 1884 thus addressed the Legislature upon this subject, speaking of the practice which had prevailed:

> The Hudson, Mohawk and Black rivers are to a very large extent fed by streams and lakes in the southern slopes of the Adirondack wilderness; and the Black river may well be regarded as the principal feeder of the Erie canal. This statement renders the importance of protecting the water in the sources of the rivers named, from serious diminution, distinctly apparent. The fact that this can only be done by the preservation of the forests bordering on the sources of water supply, needs no demon-

stration and was recognized by the last Legislature by the passage of an act prohibiting the further sale of our Northern wilderness lands.

The immense volume of commerce which passes through the Erie canal and the Hudson river to the seaboard, and the low stage of water during the summer in the last-named waterway as well as the other rivers and streams of the State, have attracted the attention of the public to the necessity of arresting the further destruction of our Northern forests.

This is certainly a very important matter, and should receive early and serious attention. We find ourselves facing the danger which now so excites the people, because the interests of the State have not been cared for in the years that are past, and because our forest-laden lands have been recklessly disposed of at nominal prices, until, at this late day, we are awakened to the fact that the control which the State should have always maintained over that part of those lands which are important to the preservation of our streams has been to a large extent surrendered.

The plan has been, it seems, quite generally adopted by the grantees from the State to refuse to pay taxes assessed upon these lands after their purchase, and to permit them to be sold for such taxes, the owner taking advantage of the time between the levying of the taxes and the sale of the land to cut off and sell such timber as he finds to his profit. In default of other bidders at such tax sale, the State becomes the purchaser. Two years is allowed the delinquent owner after the sale to redeem his land.

Sales of these lands are customarily made by the Comptroller once in about five years, and then they are sold for taxes that have remained due and unpaid for a period not less than five years prior to the sale; thus in 1881 forest lands were sold for taxes levied thereon between the years 1871 and 1876. It will be readily seen that this allows the grantees of these lands, who from the first day of their ownership deliberately refused payment of all taxes, from seven to twelve years within which to cut off and sell timber—thus realizing an immense return from the amount originally paid for the land.

At that time a system of better control of the forest lands was suggested and the project of having the State purchase immense tracts of these lands was opposed as involving an extravagant expenditure. In 1885 the attention of the Legislature was again directed to the subject by Governor Hill, who said:

The forestry problem has in late years become an important one; and through natural causes and through the operations of some industries in the northern counties of the State, it is becoming every year more important and pressing. It is claimed by those who have given the subject attention that the preservation of the forest growth, especially in those parts of the Adirondack region which are unfit for profitable tillage, is a matter of serious concern to the material prosperity of the entire State. Valuable water courses are largely dependent upon the preservation of the forest trees now standing and a restoration of a new growth to tracts which have been left waste; and this protection of rivers and streams is doubtless in this matter the chief consideration to the State at large. In addition, however, the northern counties are threatened at no distant day with a serious diminution, or even loss, not only of the profitable and rapidly growing industry of caring for the numerous persons who from within and without the State resort to their lakes and woods for health or pleasure, but also of the lumbering industry itself. It seems probable also that the owners of forest lands ought to be afforded ample protection against trespassers who set fire to or cut or injure trees upon such owners' lands.

The matter was made the subject of investigation by commission. And it was in 1885 that a Forest Commission was established, and the lands then owned or which might thereafter be acquired by the State within specified counties were constituted a Forest Preserve. The State already had considerable holdings of forest lands, principally through tax defaults. It was further provided that lands composing the Forest Preserve should "forever be kept as wild forest lands" and should "not be sold or leased by any corporation, public or private." The Forest Commission, three in number, were given the care and control of the preserve and charged with the duty to protect the forests on the Preserve and to promote their further growth.

In 1887 provision was made for the disposition of separated small parcels in the Preserve, or the timber thereon, under important restrictions.

In 1890 Governor Hill brought to the attention of the Legislature the advisability of a better definition of the limits within which lands were to be retained by the State for forest purposes and of appropriate legislation with regard to the creation by the State of a forest park in the Adirondacks. In a special message he said:

> The portion of northern New York known as the "Adirondacks" has become a great summer and winter resort for persons seeking pleasure or health, not only from our own State but from other sections of the Union. It is rapidly becoming a nation's pleasure ground and sanitarium.
>
> The State now owns a large portion of this section, which has been placed under the control of a Forest Commission. The present statutes seem to contemplate retaining all the lands that come to the State from tax sales as part of a vast park, without reference to quality, quantity or locality; and many parcels thus reserved are small and are not connected with the main body of State lands.
>
> It seems to me that the limits within which lands are to be retained by the State for this purpose should be settled and defined, and should include the wilder portion of this region covering the mountains and lakes, at and around the headwaters of the several rivers that rise in that locality, including the Hudson River; and that all the lands outside of these limits should be subject to sale as other State lands are sold. If practicable, these lands could be exchanged for wild and forest lands within the limits prescribed.
>
> Considerable complaint has been made that persons desiring to build summer camps or cottages upon lands belonging to the State have not been permitted to do so. I can see no reason why, under suitable restrictions, small parcels should not be leased at a moderate rental for such purposes. Such occupants would have an interest in preserving the forests in all their beauty, and would be the best of fire wardens and foresters, while the wilderness would thus afford a summer home to persons of moderate means, as well as to the wealthy.
>
> The subject is worthy of the most careful consideration. It is represented to me by those who are familiar with the situation and needs of that section, and in whose judgment I have confidence, that a State park, from fifty to seventy miles square, can be obtained by the State in that region at comparatively trifling expense, and that when obtained, if judiciously and sensibly managed, it will prove of inestimable value and benefit to the whole country

> A personal inspection on my part last summer of a portion of the Adirondack region confirms, in my judgment, the desirability of some appropriate legislation upon this subject.
>
> It is believed to be the true policy of the State to encourage rather than retard visitation to this delightful region, and a broader and more enlightened policy than that which has heretofore been followed should be pursued. Several reasons are apparent why it is expedient that some independent commission should investigate this matter and originate a scheme for carrying out the suggestions herein outlined, rather than the Forest Commission, whose powers are already limited by statute and whose duties are confined to a mere preservation of the forests.
>
> I think the Adirondack forests, instead of being an expense and burden to the State, are capable, under the liberal policy here suggested, of paying all the expenses of their preservation, as well as of yielding a handsome revenue to the State.

The action taken by the Legislature upon this recommendation was to authorize the Forest Commission to purchase lands located within such counties as included the Forest Preserve, as should be available for the purpose of a State Park, at a price not to exceed $1.50 per acre, but the act appropriated only $25,000 for the purpose.

In 1892 another act was passed establishing a State Park to be known as the Adirondack Park, which should be "forever reserved, maintained and cared for as ground open for the free use of all the People for their health or pleasure and as forest lands necessary to the preservation of the head waters of the chief rivers of the State and a future timber supply." And the Forest Commission was authorized to purchase land in certain counties mentioned. They were, however, given power to sell any portion of the lands within specified counties the ownership of which, in their opinion, was not needed to promote the purposes in view. The theory was, apparently, that detached pieces could be sold and that the proceeds would be sufficient to buy the desired amount within the park limits, and no adequate appropriation was made for independent acquisition on any suitable scale. This policy, however, was not a successful one, and as Governor Flower in his annual message of 1893 said, "the results today after nearly seven years' effort to establish an Adirondack Park are disappointing." He pointed out that while the existing methods would answer "the temporary purpose of getting rid of lands useless for a forest preserve and acquiring other lands needed so far as the proceeds of sales would permit, it would not do for a permanent and exclusive State policy." He added that if it was the desire of the People that the State should absolutely own two or three million acres of the forest preserve, the lands should be acquired at once by right of eminent domain, and the operation should be comprehensive and decisive, which would "be vastly more economical in the long run than the present policy of purchase by driblets."

Governor Flower's specific recommendations (in connection with a reorganization of the Forest Commission) were, (1) that forest tracts owned by individuals or private associations and used mainly for the purpose of recreation should be secured as a part of the forest preserve and guarded against denudation by a contract with the State providing for exemption from taxation in consideration of forest protection and restrictions on the removal of timber, and (2) that revenue should be secured to the State "by granting permission to fell trees above a certain diameter on State lands and to remove the timber."

Legislation embodying these recommendations was enacted in 1893 and the results were thus stated by Governor Flower in his next annual message:

> These recommendations were promptly embodied in law, and the new Forest Commission is now able to report that 225,000 acres of Adirondack land have been offered to the State upon the terms of the proposed contract and that standing spruce timber exceeding twelve inches in diameter has been sold on 17,468 acres of State land, from which it is expected that the first year's cutting will yield to the State a revenue of $52,400. These prompt results are exceedingly gratifying. It thus appears that the State forest preserve has been increased by probably a million dollars' worth of lands without any direct appropriation of public money, and that the first year of intelligent administration under the new law has insured to the State an annual revenue largely in excess of the entire cost of maintaining the Forestry Bureau. Every lover of the Adirondacks and every friend of forest preservation will rejoice at these results, but they will be particularly satisfactory to the taxpayers of the State. If from so small a portion of the Forest Preserve so considerable a revenue is received without injury to the forests, we can reasonably look forward to the time when the Forest Preserve will not only be the great conservator of our water courses and the restorer of health, but will contribute a large part of the money required for the support of the State Government.
>
> All sales of stumpage were to the highest bidder. Applications for sales were numerous and covered more timber than the Forest Commission thought wise to sell at that time. They indicate that there will be no difficulty in obtaining an annual revenue which shall not only render the Department self-sustaining, but will leave a large balance, which for the immediate future can be applied annually on the purchase of land and the enlargement of the Preserve.
>
> The legislative policy declared two years ago of selling scattered and detached tracts of State forest land lying outside the limits of the Adirondack Park has been pursued during the year, but not many sales have been made, owing to the depression in financial circles.

In 1894 a constitutional convention was held, and the desire of the People to safeguard the forests and to place their preservation beyond the reach of any form of attack was emphatically expressed. Public opinion assumed definite and authoritative statement in the amendment to the Constitution which was recommended by the convention and adopted by the People. They did not propose that any devastation of the State lands should be permitted under any pretext, and they put into the Constitution the emphatic words of the statute of 1885, which as a mere legislative enactment had been subject to legislative alteration. The amendment was as follows (Article VII, Section 7):

> The lands of the State now owned or hereafter acquired, constituting the Forest Preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold, or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed.

The policy of forest preservation was thus embedded in the fundamental law.

The special committee on State Forest Preservation of the Constitutional Convention reported that they were of the opinion that "for the perfect protection and preservation of the State lands, other lands contiguous thereto should as soon as possible be purchased, or otherwise acquired," but they felt that any action to that end was more properly within the province of the Legislature than of the Convention. Governor Morton in his annual message of 1896 described the constitutional policy as one which was "giving satisfaction to the People" and pointed out that "unless these lands are acquired within a reasonable time, they can only be obtained at higher cost many years hence." Adequate appropriations for extensive purchases, however, were not made until 1897. Governor Black in his annual message of that year thus stated the situation:

> Private individuals have taken advantage of the State's neglect until of the entire Adirondack region, consisting of more than three and a half million acres, the State owns eight hundred and forty-one thousand, less than a quarter, and of the proposed Adirondack Park of two million eight hundred thousand acres it owns even a smaller percentage, about six hundred and sixty-one thousand acres. Of this proposed park more than eight hundred and eighty thousand acres are held as private preserves and more than a million and a quarter acres by lumbermen and others, so that of the proposed total area of two million eight hundred thousand acres more than two millions are owned by private individuals. More than a million and a quarter of the two millions so owned are now subject to fire and axe, and the devastation wrought yearly is appalling and disgraceful. More than 450,000,000 feet of wood and timber are cut, and more than one hundred thousand acres stripped, every year. This work of devastation is progressing fast. The banks of the lakes and rivers and all sections accessible from either are ravaged at such a pace that but few years more can elapse before that region, in many respects the most wonderful and valuable in the world, will be practically destroyed. The parts acquired or claimed by individuals are the best. A traveler through any desirable portion of that country is sure to be met with the charge of trespassing, for the cases are rare in which the title of the State to a desirable tract is acknowledged. Sometime this deplorable condition must be rectified. Every year the loss to the State grows larger, in all cases difficult and in some cases impossible of recovery. The land is steadily and rapidly increasing in value. The bogus title burrows further out of sight the longer it is let alone. Witnesses die, and the only thing sure to increase is the encroachment of individuals upon the domain of the State. The enlargement of the canals will require more water and the demand in every direction is increasing while the supply is steadily falling off. A subject of such magnitude should not be postponed nor conducted with the halting method which is too apt to distinguish public enterprises in which large appropriations afford convenient resting places in which office holders may grow old. Not

long ago the State appropriated a million dollars to preserve the beauties of Niagara Falls. That subject is without significance compared to the Adirondack forests. Every consideration of health, pleasure, economy and safety urge the speedy consideration of this subject, and such consideration should include appropriations adequate to ascertain the nature of the titles adverse to the State, and to recover where the titles are insufficient and to purchase where they are valid. Any other course would be false and unwise economy.

Thereupon the legislature appropriated $1,000,000 for the acquisition of forest lands and created "The Forest Preserve Board" with authority to purchase tracts within the Adirondack Park. With this appropriation the Board acquired over 250,000 acres at an average cost of $3.74 per acre. In 1898 another appropriation was made of $500,000 and in the years 1899 and 1900, under the administration of Governor Roosevelt, $600,000 were appropriated for these purposes. No further appropriations were made until 1904, when there was an addition of $250,000. In 1906 $400,000 more was appropriated and this was followed by an appropriation in 1907 of $500,000. With these moneys the forest holdings of the State have largely been increased. Provision has also been made for the acquisition of forest lands in the Catskill mountains, and the Catskill Park has been delimited, and purchases have been made in this region with a portion of the moneys above mentioned.

The area of the proposed Adirondack Park is 3,313,564 acres and that of the proposed Catskill Park 576,120 acres, making a total of 3,889,684 acres. The land within this Adirondack Park now owned by the State amounts to 1,363,890 acres and within the Catskill Park the State owns 100,920 acres, making a total of 1,464,810 acres. The lands which are still held in private ownership within these parks thus amount to 2,424,874 acres. The total area of the present State Forest Preserve, including the lands acquired within the two parks, amount to 1,593,789 acres. Purchases are made from time to time where they can be effected on advantageous terms. The powers formerly possessed by the Forest Preserve Board are now vested in the Forest, Fish and Game Commissioner, and purchases are made by this Commissioner and two Commissioners of the Land Office (who are elected State officers) acting under designation by the Governor. At present the Purchasing Board is composed of the Forest, Fish and Game Commissioner, the State Comptroller and the Speaker of the Assembly.

The provision of the Constitution prohibiting the removal of timber from State lands in the forest preserve has been the subject of criticism because of the prevention of scientific forestry. The policy which makes it necessary for trees to be left to fall and decay and makes no provision for taking proper advantage of nature's laws of growth, maturity, and renewal, can not be regarded as permanent. Under careful superintendence the forests may give their natural yield for the benefit of the people without prejudicing their preservation and indeed to their benefit. This was emphasized by Governor Black. But the experience of the past has taught the People to be cautious in examining proposals for cutting timber. They fear that if the opportunity were offered for the removal of timber under any pretext, the strain upon State administration would be too strong and that avarice, looking only for immediate gains, would cause the most serious, if not irreparable, losses. They have watched the destruction of the forests too long to be easily satisfied with promises. They have not been ready to take chances of further devastation of the forests, and they will not be disposed to make changes in the constitutional provision which protects them until the rules of conservative cutting, based upon proper regard for forest protection, are so well established and observed in the exercise of private rights as to remove any menace to the public interest in case the State should be empowered to harvest its forest crop.

As Governor Roosevelt said in his annual message of 1900:

> A primeval forest is a great sponge which absorbs and distills the rainwater; and when it is destroyed the result is apt to be an alternation of flood and drought. Forest fires ultimately make the land a desert, and are a detriment to all that portion of the State tributary to the streams through the woods where they occur. Every effort should be made to minimize their destructive influence. We need to have our system of forestry gradually developed and conducted along scientific principles. When this has been done it will be possible to allow marketable lumber to be cut everywhere without damage to the forests—indeed, with positive advantage to them; but until lumbering is thus conducted, on strictly scientific principles no less than upon principles of the strictest honesty toward the State, we can not afford to suffer it at all in the State forests.

The importance of forestry was also emphasized by Governor Odell and by Governor Higgins. We may therefore look forward to a time when improved methods of caring for the forests will be adopted and when with advantage to the State's interests we shall secure their proper yield. The absolute restriction of the constitutional amendment makes, however, an emphatic protest of the People against any selfish designs upon these resources of the State and nothing will be tolerated which will in any degree open our forest preserve to greedy spoliations.

The State not only has sought to protect its forests by purchases and by agreements with owners of forest tracts, but it has also begun the work of reforestation. While this has so far been prosecuted on a relatively small scale, gratifying progress has been made. We have several nurseries and this year 1,100,000 pine and spruce trees have been set out. This work can be conducted with comparatively small outlay and in a constantly increasing measure. Appropriation was also made at the last session of the Legislature to establish additional nurseries for the propagation of forest trees to be furnished to citizens of the State at

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cost and to be planted under the direction of the Forest, Fish and Game Commissioner.

There has also been a heightened appreciation of the importance of preserving and caring for our natural wonders and places of rare beauty and grandeur which are of inestimable value for the enjoyment and the inspiration of the people. In 1883 provision was made for the appropriation of lands at Niagara Falls, and a State reservation was constituted. The Legislature has declared that it "shall forever be reserved by the State for the purpose of restoring the scenery of Niagara Falls and preserving it in its natural condition, and kept open and free of access to all mankind without fee, charge, or expense to any person for entering upon or passing to or over any part thereof." A beautiful park adjoining the Falls has thus been provided, depredations have been prevented, unsightly structures have been removed, excellent roads have been laid out, guard rails and bridges have been built and in all the work of improvement unnecessary artificialities have been excluded. Natural slopes have replaced artificial banks, trees have been planted and barren spots have been beautified by suitable growths. Thus the visitor to Niagara's sublime spectacle may view the Falls from a borderland under the protection of the State where accessibility and convenience have been provided without sacrifice of beauty. Efforts to prevent improper diversion of power and the consequent impairment of the Falls culminated in the Burton bill passed by Congress in 1906.

Through the influence of the late Honorable Andrew H. Green, of New York, who had been prominent in the work of restoring natural conditions at Niagara Falls, the American Scenic and Historic Preservation Society was founded in 1895, an organization through which the public demand for the preservation of places of scenic and historic interest has found powerful and effective expression.

It was in 1895 that commissioners were appointed in New York to meet with similar commissioners of New Jersey for the purpose of devising means for establishing a reservation of the Palisades of the Hudson. In 1900 the Palisades Interstate Park was established under the care of the two States, represented by a joint commission. A large amount of shore frontage has been acquired, and in this way the devastation of the Palisades has, to an important degree, been prevented.

In 1906 the beautiful Watkins Glen was acquired as a State reservation. In 1907 the Bronx River Reserve was established, consisting of lands on either side of the Bronx river in New York and Westchester counties, for the purpose of preserving the river from contamination and of creating a parkway for public use.

Last year also the State received a munificent gift from William Pryor Letchworth, a distinguished citizen of the State who has rendered long and notable service in the cause of philanthropy. Mr Letchworth has conveyed to the State, for the purposes of a public park, a tract of rare beauty lying in Wyoming and Livingston counties of about one thousand acres in extent. Through this tract, now known as Letchworth Park, flows the Genesee river, with sublime scenery of canyon and waterfall. It is a territory of extraordinary variety of native growths, affording exceptional opportunities to the naturalist and a retreat of peculiar charm for the lover of nature. This benefaction fitly crowns a long life of devotion to the public welfare.

During the present year another addition has been made to the State reservations by provision for the retention and development as a public park of the property at Fire Island, on the Long Island coast, which was acquired some years ago for the purposes of temporary quarantine. In view of the growth of metropolitan population, the holding of this strip of seaboard for park purposes can not fail to be of great public benefit.

A matter of extreme importance to the future prosperity of the State is the development and control of its water powers. With increased facilities in the transmission of electrical power, the subject compels attention, as the control of the water powers of the State will mean largely the domination of its industrial activities. From recent statistics it appears that of the entire horsepower developed by water for manufacturing purposes in the United States, over one-quarter is used in New York. And New York is fortunate in having within her borders so many sources of power, and in possessing extraordinary opportunities for further development. It is difficult to overestimate the great importance of this subject and the necessity of taking wise action at the present time in order that we may properly care for the interests of the future.

In my annual message to the Legislature of 1907, after referring to the importance of the policy of acquiring forest lands, I said:

> In this connection it is well to consider the great value of the undeveloped water powers thus placed under State control. They should be preserved and held for the benefit of all the People and should not be surrendered to private interests. It would be difficult to exaggerate the advantages which may ultimately accrue from these great resources of power if the common right is duly safeguarded.

After referring to the legislation which had created a Water Supply Commission, charged with duties with regard to potable waters and river improvement, I added:

> It remains to be considered whether it is not advisable to provide a more comprehensive plan, embracing in a clearly defined way the matter of water storage and the use of water courses for purposes of power. The entire question of the relation of the State to its waters demands more careful attention than it has hitherto received in order that there may be an adequate scheme of just regulation for the public benefit.

Pursuant to this recommendation, the Legislature of 1907 directed the State Water Supply Commission "to collect information relating to the water powers of the State and devise plans for the development of such water powers," and appropriated $35,000 for the purpose. The act contemplated a thorough investigation and the submission of accurate information and comprehensive plans.

The Commission entered zealously upon its work and procured competent expert assistance. In February last it made a valuable preliminary report in which the general phases of the subject were presented in a most interesting and instructive manner:

> Excluding Niagara and St. Lawrence, the rivers of the State, with the proper storage of their flood waters, are capable of furnishing at least 1,000,000 horsepower for industrial purposes. On account of the wide difference between the minimum and maximum flow of the streams, the minimum flow being the real test of the power value, at least 55% of their potential energy is lost to the owners of water rights and to the People of the State. It is clear, therefore, that 550,000 horsepower of energy is annually allowed to run to waste because no well-devised and comprehensive plan for the general and systematic development of water power has yet been undertaken by the State.
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> At a low estimate the advantage of water over steam power is at least $12 per horsepower per year. The annual earning capacity of the wasted energy based on even so low an estimate is $6,600,000. Add to this the $1,000,000 per year of direct damage caused by floods, and the indirect damage which no one has yet been able to determine, but which is surely equal to the direct damage, and the value of an equalized flow during the summer months in the great rivers, which is not inconsiderable, and the possibilities to be derived from proper treatment of the Niagara and St. Lawrence, and the aggregate will give some idea of the value to be obtained by the systematic development and increase of the water powers of the State.
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> The rivers of the State are and have been open to inspection by every one. The locations of falls and power sites have long been known to individuals and it has not been difficult to acquire them. Meantime the possibilities of power development have been steadily growing and the advantages to be gained thereby have been constantly increasing. It is not strange therefore that far-seeing men have purchased nearly all of the most desirable water power within the State, except such as may be situate along the boundary rivers.
>
> Up to this time there has not been, and under present conditions there can not be, such economical and general development of water power by private interests as will include the storing of flood water on a scale at all commensurate with the advantages to be gained thereby. It is from this method that the greater amount of increase is to come. Moreover, the individual or corporation that invests money usually does so in the hope of immediate gain—the larger the immediate profits the more enthusiastic the promoter. There is therefore the temptation to cut out of the work everything that can be postponed or avoided, no matter how essential it may be to the future success of any well-considered plan. The storing of flood waters will provide not only power development at the site of the dam, but will also increase the power of every user down the stream. The fear of improving the plant and the power of a competitor might well restrain an owner of water power from going farther upstream and building a storage dam that would increase the value of his neighbor's plant as well as his own. It is also very difficult for several interests to combine in aid of such a project. Even

though they should be willing to engage in a joint enterprise for such a purpose, there would be still the lack of power to condemn land for storage purposes for which recourse must be had to the law-making body.

The United States census of manufactures for 1905, bulletin 88, shows that of the 1,647,969 horsepower developed by water in the United States for manufacturing purposes, 446,134 or 27½% was used in the State of New York. This is more than twice as much as is used by its principal competitor, the State of Maine, and more than one-half as much as the total steam power for like purpose used in the State. The increase in water power in this State from 1900 to 1905 was over 100,000 horsepower. This rapid increase in so short a period is, without doubt, one of the causes which has attracted the attention of economists to the value for the State's own benefit of this branch of its natural resources.

By means of storage dams constructed by the State at available points in order to hold back the flood waters of many of our large rivers, it is possible so to equalize their flow as to more than double the available horsepower they now produce. Such improvement can be made to yield a revenue that will not only pay the cost of constructing and maintaining the dams, but that also will provide a large income for the State for all time.

The Commission believes that through the building by the State of storage dams, thus conserving water for power purposes, five distinct advantages will accrue.

(*a*) The construction of such dams will decrease the annual damage by flood waters.

(*b*) It will assure a larger minimum flow, which will improve the sanitary conditions.

(*c*) It will provide a deeper channel for the Hudson, thus improving navigation and ensuring an abundance of water for the increasing needs of the canal.

(*d*) It will provide cheaper power for manufacturing purposes, and by stimulating various industries furnish larger fields of employment, while insuring uninterrupted labor in already existing plants.

(*e*) It will provide a satisfactory annual income to the State.

Each of these points is in itself worthy of the careful investigation which the Legislature has directed to be made.

Controllable power is the vital force in our industrial development and one of the chief elements upon which civilization is based. Manufactories, transportation, and artificial light are largely dependent upon it. The more complex our civilization, the more intricate our manufacturing enterprises, and the more important rapid transit becomes, the greater our dependence upon this force. There are two sources of power available—coal and falling water. Both require skill and money to turn their latent force into active energy. Coal once used is gone, but water, however often utilized, returns again. Coal is growing less plentiful and more expensive, while water by the processes of nature keeps up its original force without additional cost.

It is universally conceded that the use of falling water for power purposes is much more economical than coal. As a competition becomes more acute the value of water power over steam becomes greater. Cheap power must continue to be a vitally interesting subject to those who manufacture goods, provide transportation, and furnish light. The discoveries which permit the carrying of electrical currents a long distance have largely increased the value of falling water for power purposes. Such power must of necessity continue to grow in value as new opportunities for its use appear, and as the price of fuel advances.

This is a plain statement of an almost elementary truth with which all who stop to consider our industrial conditions are familiar. This economic condition is attracting attention to the possibility of the greater use of falling water and constitutes a summons to those in authority to provide a way to save the lost energy that is annually allowed to run to waste in our rivers.

For years nature has presented the spectacle of wasted energy in water courses, and the action of the Governor and Legislature in directing so important a work as the conservation of this wasted power meets the hearty approval of all who have given the subject serious thought.

The Commission also gives the results of preliminary studies in different sections of the State. At the last session the Legislature appropriated $75,000 for further investigations by the Commission, and it is confidently expected that as a result of its work there will be an important development of our water powers and their conservation for the benefit of all the People of the State.

In connection with this it may be noted that the State last year established a precedent of requiring proper compensation for grants of power privileges in public waters.

Water power privileges have been granted in the past without any provision for a payment to the State in return for what the State gives. These grants have frequently been made without proper reservations or conditions and without anything constituting a suitable consideration. They have amounted simply to donations of public rights for private benefit. It does not fetter individual enterprise to insist upon protection of the common interest and due payment for what is obtained from the public. Last year on the grant of a franchise to a development company which was to develop power from the St. Lawrence river it was insisted that provision should be made for compensation for the privilege upon a sliding scale according to the power developed. And thus it was established that hereafter in the State of New York public privileges, on terms of justice to the investors and the public alike, must be paid for.

The conservation of our resources means not simply their physical preservation but the safeguarding of the common interest in the bounties of nature and their protection both from the ruthless hand of the destroyer and from the grasp of selfish interest. The course of events in the State of New York during the past few years, which has been but imperfectly described, is full of encouragement to those who have faith in the capacity of the People to protect their just concerns and to secure administration which places the general welfare above every consideration of mere private advantage. The progress in the State of New York to this end is significant of a healthy growth of sentiment which the meeting of this Conference can not fail further to promote.

CONSERVATION OF PENNSYLVANIA'S RESOURCES

EDWIN S. STUART

GOVERNOR OF PENNSYLVANIA

President Roosevelt should be universally commended for inaugurating the national movement for the conservation of our natural resources, and much good is bound to come from the deliberations of this Conference. Our material development will depend on the treatment and care accorded our natural resources. The movement demands prompt and intelligent consideration.

The American People are on the verge of a timber famine. The annual consumption of lumber is now more than three times as great as the annual growth. At the present rate of growth and consumption the day is not far distant when the scarcity of wood will be felt in our homes as well as in our industries. Equally serious is the waste of soil, which is due to the reckless destruction of our forests. Every time our creeks and rivers become muddy we can see the action of swollen streams in robbing the land of its fertility. Forests regulate the distribution of rainfall and lessen the frequency and the destructive effects of floods and freshets.

Pennsylvania is especially interested in the conservation of the country's natural resources because of the large coal deposits and forest reservations found within her borders. The annual floods in Pennsylvania, especially in the Pittsburg district, causing loss of life and enormous destruction of property could be controlled, in large degree, and probably prevented by proper forestation of the nonagricultural lands within the various watersheds.

While Pennsylvania was one of the first States in the union to undertake the conservation and development of her forests, and has made a commendable beginning, now owning more than three-quarters of a million acres of forest land, it is hoped that the State will ultimately be the owner of at least six million acres of forest reservations, and that all owners of nonagricultural land will at an early date devote it to the growing of trees. The forestry work in Pennsylvania began in 1893, principally through the efforts of Dr J. T. Rothrock, the Ex-Commissioner of Forestry for Pennsylvania, now a member of the State Forestry Commission, to whom much credit is due for the forest reservations the State now owns. The first lands were purchased in 1897. The State has already expended more than $2,225,000 for the purchase and care of forest lands. Pennsylvania having thus early recognized the vital importance of conserving her forests, created the Department of Forestry, conferred upon it broad powers and gave it large appropriations. The Legislature of 1907 appropriated for the two fiscal years beginning June 1, 1907, $500,000 for the purchase of forestry lands and about $200,000 for the purchase of seedling trees, for the payment of the employment of foresters and forest rangers and for other necessary expenses incurred by the Department of Forestry. As an example of thorough and systematic forestry, Pennsylvania has to a large extent been able to prove that the heretofore vital problems of forest administration, especially that of forest fires, have to a great extent been solved. The value of forest timber destroyed by reason of forest fires was reduced from $834,000 in 1900 to $70,000 in 1906, proving conclusively that the employment of foresters and rangers by the Department of Forestry in Pennsylvania has been wise and profitable.

We have established in our State and are conducting a State Forestry Academy with gratifying results, wherein young men are taught the principles of scientific and practical forestry. After graduation they are employed as foresters on the Pennsylvania reserves. This Forestry Academy, I am informed, is the only institution of its kind in the western hemisphere.

Physical geography and history combine to testify that a well watered country is always a prosperous country. Nations which fail to conserve their water supplies have already begun to decay. The community that has an abundance of pure drinking water will rear a vigorous and stalwart race.

In the Department of Health in Pennsylvania, in the State Capitol, hangs a large map designed with the object of indicating the sources of water supply of the State as a guide to her engineers in studying questions of pollution of streams. No one looking at this map can fail to note with amazement the wonderful way in which nature has provided her with water courses.

There is scarcely a square mile of Pennsylvania's territory which is not intersected by a stream. Many of these are mighty rivers of great volume and length. Others are of very rapid flow, constituting immense sources of supply. All spread fertility and prosperity along their borders and promise support to a teeming population so long as they are preserved in their original abundance and purity. Pure food and pure air are essential of course, but they are less requisites for life than is pure water.

In the conservation of our water supply the restrictions of our drinking waters to their virgin purity must be held steadily in view as an ideal. Pennsylvania's possession of other valuable resources readily convertible into cash, such as coal, lumber, oil and natural gas, has diverted the attention of her People from the prime importance of protecting her watersheds. Hillsides are denuded and farms too often lie idle. Side by side with this neglect of a great natural advantage goes the willful waste and even destruction of those other natural resources. The supply of oil is manifestly diminishing. Experts can with reasonable certainty determine the period when anthracite will be exhausted. It is fast becoming a luxury. The bituminous deposits are vaster indeed, but they are all being noticeably depleted. The large deposits of coal, anthracite and bituminous, which underlie the valleys, hills and mountains of our State one of these days will have been exhausted. It is exceedingly proper that some steps should be taken to conserve these deposits. The coal output in Pennsylvania for 1907 was 235,615,485 tons, which represents a tonnage almost as large as Great Britain, and about five times as large as any other State in the Union. Pennsylvania is the greatest coal producing territory in the world. Coal is produced in thirty-seven counties, the anthracite field comprising ten counties and the bituminous twenty-seven. More than 50% of the total production of coal in the United States from 1814 to the close of 1907, or 3,786,447,565 tons, was mined in Pennsylvania.

Government statistics show that great quantities of coal are being wasted every year in the United States through improper methods. This statement compels the serious conclusion that one of the most important problems before the country is the conservation not only of our timber, but also of our fuel supplies.

For long to come steam will be our principal motive power. But steam requires the consumption of immense amounts of fuel. Even if we succeed in replacing our destroyed forests, some other source of energy must be sought by which the consumption of coal by the steam engine may be diminished. The only other available source at the present time is gravity, through the development of water power. Pennsylvania is both mountainous and well watered, the two essential conditions for the development of water power. To be available both for power and for transportation the use of water must be controlled properly. Fortunately its employment for other purposes need not in the least interfere with its use for agricultural or drinking purposes if conducted under proper restrictions.

Whatever may have been the conditions of intercommunication a century ago, we are dependent today for our very existence on the great transcontinental trunk lines of railway. In the first half of the nineteenth century the Commonwealth of Pennsylvania developed her inland waterways to a very extensive degree and spent thereon upwards of forty millions of dollars. The canals built by private enterprise may have represented an investment equally as great. The slack-water improvements of the Monongahela river have been taken over by the Federal Government and great changes in navigation have been carried forward on that river, and the Allegheny and Ohio rivers keep pace with the remarkable commercial developments of the Pittsburg district. There can be no doubt about the value of water transportation for certain kinds of freight. Whether, however, from considerations apart from conserving natural resources it would be profitable to rehabilitate the canals of Pennsylvania or to maintain slack-water navigation of her streams in conjunction with demands for the development of water power is a subject for cautious and deliberate consideration.

Undoubtedly stream navigation improvement would call for regulation and control of the rivers and their watersheds. Preservation and replacement of forests as conservators of moisture, and construction of reservoirs to hold back floods and to deliver the water during dry periods are collateral matters. The deforestation of the extensive mountainous regions in Pennsylvania has caused the rivers which rise in our State at times to shrink to their narrowest limits, and at others to become mighty torrents overflowing their banks, destroying lives, and damaging property to the extent of many millions of dollars. By attention to farm cultivation at the headwaters, by reforestation of denuded areas and by attention to other details of stream control, wealth would be added to the Commonwealth. The waste of each by negligence now is inexcusable. The life not only of Pennsylvania but of the entire nation is absolutely dependent upon the conservation of her water supplies, of her forests, of her materials for combustion, and of her other natural resources.

CONSERVATION OF HUMAN LIFE

ANDREW L. HARRIS

GOVERNOR OF OHIO

Feeling that the conservation of the lives of our People is a most important subject, deserving of the highest consideration, the following preamble and resolution are placed before the Conference in lieu of any more extended address:

Whereas, The conservation of human life is a consideration paramount in its moral and economic significance to the conservation of natural material resources; be it

Resolved, That this Conference appoint a Committee to investigate the subject of protection for human life, however employed in the vitalization of natural material resources, and to recommend such regulations for adoption by the several States as, in its judgment, will tend to prevent, to the fullest possible limit, personal injury or loss of life by workmen employed in such vocations.

MICHIGAN AND HER RESOURCES

FRED M. WARNER

GOVERNOR OF MICHIGAN

The distinguished president of the University of Michigan has assured you of the hearty sympathy of the Peninsular State in this important movement which has for its object the conservation of the resources of the country. It simply remains for me, the Chief Executive of the State, to pledge you the enthusiastic support of our People in all well-directed and legitimate efforts to make the most of that which we have and to rehabilitate the places which, through lack of foresight or overdeveloped energy, have been laid waste and exhausted.

While the great question which has been considered at this Conference is one which concerns alike all sections of our country and stretches far into the future in its bearing upon the lives and the welfare of our children and our children's children, it is of greater importance to no State and no People than to the great State of Michigan and its inhabitants.

Endowed by nature with what appeared to the early inhabitants to be inexhaustible resources of mine and forest, bordered by the majestic sweep of the Great Lakes, traversed by inland waterways of unusual capacity and dotted with hundreds of beautiful lakes which contribute in no small degree to the transportation facilities of the State, and blessed with unsurpassed agricultural wealth and possibilities, Michigan has a peculiar interest in all the phases of the work of this Conference.

Its citizens have seen its vasts forests practically exhausted, and its mines invaded to an extent that threatens their depletion. They have seen other resources of the Commonwealth wasted through a lack of appreciation of their value and of the fact that it was possible to exhaust them.

Having in mind the lesson thus learned at so great a cost, the people of Michigan welcome any movement which seeks to insure only a wise use of these great gifts of nature and their preservation for the needs of future generations. They are also ready and eager to heartily cooperate in the work, to the greatest possible degree, of making glad the waste places and restoring to the fullest extent that which has been utilized either wisely or otherwise to the end that those who come after them may enjoy the blessings of nature which have been or still are theirs.

In this connection it may not be amiss to emphasize the need for widespread and intelligent cooperation in the work of lessening the enormous fire waste annually experienced in this country. Here is a calamity, to a large degree preventable, which utterly and completely removes great values from the face of the earth. Through insurance funds and otherwise the property thus destroyed can, to a large measure, be replaced, but it can never be restored. Fire is annually wiping out for all time resources which should be protected and preserved for the benefit and use of mankind. In the work of fire prevention through laws and ordinances which will insure better building construction, and through the application of penalties for permitting preventable fires, we can learn much from the older countries of the world. It is to be hoped that the scope of the beneficent work which will follow in the wake of this Conference will be made to include this important feature.

The time for action is now. Coordinated effort has already been too long delayed. Michigan welcomes the call to action and pledges its loyal and enthusiastic support.

NATIONAL EFFICIENCY

Henry A. Buchtel

GOVERNOR OF COLORADO

The most cheering fact about this first Conference of Governors with the President is the manifest purpose to find points of contact and to avoid points of divergence. When we reach that stage of development where the representatives of the People in all legislative assemblies shall be seeking points of contact and avoiding points of divergence, we shall find adequate solution of every perplexing public question. A difficult public question is half solved in our country when it is clearly stated. This is true because the heart of the Nation is sound.

The situation we now face in the possible exhaustion of our natural resources should arouse all State legislatures and the National Congress to provide the necessary legislation through which we may make an end of reckless waste. This Conference of our Executive Officers has stated the problem with clearness. Next comes the solution. That is the business of State Legislatures and the National Congress.

The next Conference of Governors with the President ought to give some time to the consideration of that larger and greater problem to which President Roosevelt called attention in his opening address, namely, the problem of national efficiency. That in the last analysis is the most conspicuous of all our national problems. We dare not stop with the consideration of the creation and conservation of material wealth as an end in itself, but we must always consider the creation and conservation of material wealth as a means to the true end of our national life, which is the making of men and women of sound moral fiber.

WYOMING'S VIEW OF FORESTS

BRYANT B. BROOKS

GOVERNOR OF WYOMING

Since listening to the able remarks made yesterday by the Honorable Secretary of the Interior relative to water power development in the forest reserves and their control by the Federal Government, I feel that Wyoming's position in this matter should be briefly stated. Wyoming is one of the best watered States in the arid West. Her streams and rivers feed both oceans and fertilize the farms of every adjacent State. Our rivers have a vertical fall of nearly a mile from their source to where they leave the borders of the State. Consequently the opportunities for water power development are simply endless and beyond computation.

In the near future this water power will be utilized, and in granting water-power rights Wyoming has determined to protect posterity and profit by the experience of some older States and nations. We know that the water-power resources of Wyoming have an enormous value, and should be developed for the benefit of the whole State, rather than made a means of taxing the State for the enrichment of outside corporations.

There is no reason in economics or good government why any State should give perpetually free water power sites to wealthy syndicates, knowing that later on these will be amalgamated into huge companies, constituting monopolies of energy more indefensible and irritating than the present monopoly of oil.

In Italy water-power rights are limited to thirty years, and any party developing power pays sixty cents per year per horsepower, and at the end of the thirty-year period this is subject to further regulation; yet American machinery is being purchased and used to develop power under these laws. In Canada, any party making a filing on water power has to pay a tax on that filing from date of making it, whether he develops it or not. Furthermore, this Canadian power privilege is a license, subject to an annual license fee and a regulation of charges, whenever the Government thinks fit.

Wyoming intends to act along these lines. Under our State Constitution, "The waters of all natural streams, springs, lakes or other collections of still water within the boundaries of the State are declared to be the property of the State," and our Constitution states further, "Water being essential to industrial prosperity, of limited amount and easy diversion from its natural channels, its control must be in the State, which in providing for its use shall equally guard all the various interests involved."

Bearing this clause of our Constitution in mind, the people of Wyoming believe the Federal Government can exercise no control over the waters of Wyoming, and that certainly the Forestry Department has no right to charge for power privileges or for water which runs from various reserves. We do not believe in the idea of accomplishing all reforms through Federal agencies. We consider water-power privileges, irrigation and drainage as essentially local matters, leaving to the people of our State the full right under our Constitution to use the water and to say how it shall be conserved and controlled. These corporations are purely domestic in their character and should be controlled by the State, and all charges made upon them should go to the benefit of the State and not to increase Federal revenue; and inasmuch as these industries and plants can and should only be subjected to a reasonable charge, any fee laid upon them by the Federal Government diminishes by that amount the income that the people of the State may be able to derive from the development of resources of this character.

Wyoming has already framed wise laws and regulations to govern the use of water for irrigation, and the same can be applied to hydro-electric development. On the other hand, so far as I know, the National Government has never suggested any rules or regulations relating to the supervision or administration of this natural resource. To date, no misuse has been made of the water-power resources of Wyoming, and the people of that State feel fully competent, without any assistance from the Federal Government, to see to it that no waste or misuse occurs in the future.

CONSERVATION IN HAWAII

WALTER F. FREAR

GOVERNOR OF HAWAII

Even the most far-reaching problems may often be illumined and sometimes solved by observation or experiment upon a small scale. The laboratory, by its processes of bringing forces into clear relations, may in a moment disclose principles that centuries of national or world-wide experience have left unsuspected. Little, distant Hawaii, now an integral part of the Union as a full-fledged Territory, has been, ever since the beginning of Christian civilization there less than a century ago, a veritable laboratory of industrial as well as sociological experimentation under conditions that have seemed almost artificial in the clearness of the relations of the operative forces. It may be that she can shed light, at least by way of illustration, upon some of the needs, methods, and means involved in the all-important national questions presented to the Conference.

I will present but two points. The first is the marvelous results of the application of science to agriculture. That has been in large measure the making of Hawaii industrially.

That Territory is a group of lofty islands of recent volcanic origin, within the tropics, remote from the world's markets. Practically without mineral resources, she is dependent mainly on her soils; but, although nearly as large as Connecticut and Rhode Island combined, so much of her area is so high or so precipitous or so recently formed or so dry or otherwise unsuited to marketable crops that only a very small percentage can be classed as arable in its natural condition and in the present state of knowledge. Obviously, if she is to support a large population, science must do what nature has left undone, and accordingly perhaps nowhere else is science now being more resorted to for agricultural purposes, and yet only a beginning has been made.

The limited extent of arable public land in Hawaii—and, comparatively speaking, now on the Mainland—calls for the greatest care in its disposition. Adequate precautions should be taken to insure its disposition in general only to bona fide settlers and in not larger quantities to each than can be put to best use; and until a superior use can be found for the large areas still held as public land for which no such use is known at present, they should in general be retained or disposed of only temporarily by lease or otherwise until a superior use is discovered for them. Hawaii's experience in earlier liberal disposition of the lands and later discoveries of superior uses emphasizes the need of such precautions.

Until a few years ago attention in Hawaii was directed almost exclusively to the production of cane sugar, which, in spite of various adverse natural conditions, has been brought by the application of science to the highest point of efficiency yet attained anywhere—so much so, indeed, that from her comparatively small acreage of cultivated land Hawaii will produce this year more than $40,000,000 worth of sugar alone, or more than one-sixth of this country's consumption of that product, and her exports and imports, with this product as almost their sole basis directly and indirectly, will considerably exceed those of the entire United States at the time of the adoption of the Constitution.

Hawaii being within the tropics, the question of water is of superlative importance. The rainfall is abundant, ranging from a few inches to several hundred inches a year according to locality, but the more abundant fall is usually distant from the land where it is most needed. The problem is that of its conservation by way of preventing it from escaping immediately to the sea in freshets, and that of transferring it to the arid lands. It has been demonstrated that land which, with an ample supply of water properly applied produces, say, 10 tons of sugar to the acre, produces only four-fifths of a ton under a rainfall of 32½ inches a year. Most of the irrigated plantations have less than this amount of rainfall; 105,000 acres or about one-half of the 213,000 acres devoted to sugar production, only about one-half of which is cropped annually, is practically reclaimed arid land, entirely through private enterprise. The reclamation of this land has involved an expenditure of about $15,000,000 or more than $140 per acre in initial outlay for the construction of ditch, tunnel, flume and pipe lines, reservoirs, pumping plants, artesian and surface wells, and electric plants for the generation of power for pumping plants. A single system for one group of plantations includes about 225 miles of main and lateral ditches, tunnels, etc., costing a million and a half dollars, besides wells, reservoirs and pumping plants. In one instance, electric power is generated by water on the rainy side of the island for the operation of pumps on the opposite or dry side. There are 111 pumps in operation with a capacity of 580,000,000 gallons per 24 hours. Sixty per cent of the water used on irrigated plantations is pumped. The average lift is 191 feet, with a maximum of 550 feet. One acre requires about 5,000,000 gallons per crop or about 10,000 gallons per day. The expense is great but it is a necessity and it pays. The irrigated lands produce nearly twice as much as the unirrigated. Though constituting only half the total area, they produce about two-thirds of the total output of 500,000 tons of sugar.

In view of the foregoing, the preservation and extension of forests are obviously prime necessities. The typical island consists of a high central mountain with radiating ridges and valleys. From ancient times the islands have been subdivided in apple-pie fashion, the typical main division of land extending from seashore to mountain top and comprising one or more valleys with their side ridges. Even in ancient times each valley had its own net-work of small ditches for purposes of irrigation. The watersheds are short; the slopes, steep; there are few permanent springs; it is the forests that must be relied on to hold the water for the steady supply of the streams. The relation between the forests above and the near-by arable plains or gentle slopes below in respect of water supply is too obvious to be disputed. Before the possibilities and needs of irrigation became apparent, much wasting of the forests by cutting and through destruction by live stock was permitted, with most disastrous results, as it now appears. Accordingly, more than thirty years ago, steps were taken by legislation for the preservation and extension of the forests, but not until five years ago was a comprehensive statute passed creating an effective board of agriculture and forestry with adequate powers. Since then 444,000 acres have been set aside by 16 proclamations of the Governor on the recommendation of the board as forest reservations, of which 61% is Government land, and within the next few years this area is expected to be extended to about 750,000 acres, or about 80% of the total forest area, of which about 70% will be Government land. Government and private lands are sandwiched in with each other and it is of the greatest importance that the Government and private owners cooperate with each other in this matter. Fortunately the need is so obvious and the methods of procedure have been of so friendly a nature that practically no difficulty has been experienced in obtaining the active cooperation of private owners in the setting aside and fencing of reservations and the keeping out of live stock. In addition to this nearly one-fourth of the sugar corporations, besides many ranchmen and others, are actively engaged in tree planting. Only a comparatively small percentage of forest area or area available for forest on the mainland is in Government ownership. If forestry is to be carried to the extent desired it is essential that private owners be induced to cooperate with the Government or else that private lands be condemned for forest purposes. The principal means of bringing about cooperation would seem to be education—a means which this Conference will largely serve to effect and which is already being effected through many other channels.

It is not alone to the question of irrigation in connection with the sugar industry that science has been called upon to contribute. It has been called upon to contribute equally in almost every phase of that industry—in methods of manufacture and cultivation, fertilization, chemistry, entomology, plant pathology and physiology. More than $2,000,000 is expended annually in the purchase of fertilizers, besides which large quantities not purchased are used. The cost for this item alone averages $4.65 per ton of sugar or $22.20 per acre per crop. The planters maintain an experiment station with a large corps of scientists, covering nearly every department of the industry, at an expense greater than that of any experiment station, public or private, on the mainland, with possibly one or two exceptions.

So much as to one industry by way of illustration of the value of the application of science to agriculture in all its aspects. Through the Federal Experiment Station, the Territorial Board of Agriculture and Forestry, and other mediums a good beginning has been made in the same direction in other industries with most promising results—in the pineapple, rubber, sisal, tobacco, rice, and other industries. A college of agriculture has been established; instruction in agriculture as well as in the mechanic arts is made more and more prominent in the public schools, a beginning having been made in this direction as long ago as

1831 and 1836, when industrial training schools, the first in the United States, were established, which in large measure suggested to Gen. S. C. Armstrong, who was born and brought up in Hawaii, the ideas which he later embodied in Hampton Institute.

The needs and opportunities are such that every effort must and will be made in Hawaii to perfect a science of tropical agriculture and build up a group of tropical agricultural industries to the highest point of efficiency to which they can be brought by the application of scientific methods. What is needed now, outside of transportation and other facilities, through the scientific branches of the Federal Government, is assistance in forestry and in soil, topographic and hydrographic surveys and branch experiment stations—so comparatively new is the field of scientific tropical industry and so unique are the conditions of wide variation in rainfall, temperature, and soils within shortest distances in Hawaii.

The second point to which I wish to refer is that of the location of Hawaii at the commercial center or cross-roads of the Pacific—which, the greatest of oceans, between the richest of continents, is fast approaching the fulfillment of the long-ago prophecies of von Humboldt, Seward, and others, to the effect that it would eventually be the theater of the world's greatest commerce. If the inland waterways of the mainland, especially those of the great Mississippi valley, are to be developed to the extent which seems likely in the near future, and if the Panama canal is to be completed, as it must be, within a few years, not only is it a corollary that Hawaii must be provided with adequate harbor facilities in order to make these other greater works serve most completely their purposes, but obviously one of the most effective methods of conserving the natural resources of the United States is by taking advantage, through these provisions for adequate transportation facilities, of the vast natural resources of other countries and especially those of China, which are perhaps, next to those of the United States, the richest in the world and as yet practically untouched. The location of Hawaii, which thus far has proved one of the greatest obstacles to her industrial prosperity, will hereafter be one of her greatest assets, and with the proper development of her harbors through Federal aid she will, small though she is, have the proud honor of playing a part out of all proportion to her size in the conservation of the natural resources of the nation.

INTEREST OF THE NATIONAL CAPITAL

HENRY B. F. MACFARLAND

PRESIDENT OF THE BOARD OF COMMISSIONERS OF THE DISTRICT OF COLUMBIA

The District of Columbia has only seventy square miles of land and water. Its natural resources may be regarded as inconsiderable compared with those of the States. From the commercial point of view this is true, although from the esthetic point of view we might claim rich resources in the natural beauty of our situation. And we have a deep interest in the conservation of all our natural esthetic resources. Would that all the woodlands, and every other natural park and parkway, might now be preserved for the future by immediate purchase, as a part of the National Capital system of parks, or included in the national forest reservations, and that all the streams might be saved from misuse and possible destruction, and especially that the Potomac river might be linked in with that great program of waterway development which has been outlined by the Inland Waterways Commission, whose fruitful labors suggested this Conference!

Moreover, this is the National Capital, and as such it has a deep and special interest in this Conference, which could not appropriately have been held anywhere else. The interests of all the States center here. The citizens of all the States are at home here. Our hospitality has been shown to this Conference according to our ability, but it was not necessary to offer a formal welcome to the common Capital. The progress of our country is symbolized in the progress of its Capital, and the people and the government of that Capital have a personal interest in everything that will promote the national prosperity and progress. Therefore this Conference, unique in the character of its members, and in their representative qualities, including the largest number of Governors ever assembled in the United States, the instructive and enlightening and even inspiring character of the addresses and the discussions, all on such a high plane of patriotism, and the wisdom of its conclusions, are highly gratifying to the citizens of the District of Columbia. They appreciate that this Conference begins a new chapter in the life of the Nation, and that it is one of the remarkable achievements of the administration of the present President of the United States, distinguished as it is for remarkable advances in the social and economic policies of our country.

RESOURCES OF FLORIDA

E. H. SELLARDS

STATE GEOLOGIST OF FLORIDA

I beg to express the regrets of Florida's Chief Executive, who is unable to attend the Conference, in the results of which he is profoundly interested, and to the solution of some of the perplexing problems of which he has, in his own State, devoted his best efforts. Florida is vitally concerned in the development of its inland and coastwise waterways, in perpetuating its forests, in the utilization of its soils and mineral resources, and in the drainage of its swamp lands.

In extent of coast line in proportion to area Florida stands first among the States of the Union. The configuration of this extensive coast line is such that exceptional opportunity is offered for the development of protected coastwise traffic. The inland waterways, too, are capable of great improvement. The comparatively slight elevation which in places separates the Atlantic from the Gulf drainage permits the construction of inland canals at an expense which is insignificant as compared with the benefits to be derived.

In the matter of drainage of swamp lands, the State under the direction of a drainage commission has undertaken the work on a large scale, namely, the drainage of the vast area of the Everglades. To this work the Governor of the State has given his special attention, and I only regret that he is not himself present at this time to give you a report of progress in that work. The total amount of as yet unutilized swamp land in the State is large. Very much of this, aside from the Everglades, lies in small areas in various parts of the State. The topography of Florida has been determined largely by the removal through underground water of porous and soluble limestone, resulting in depressions and consequent swamps or shallow lakes. It remains to be seen by exact leveling and topographic mapping to what extent these smaller swamps are capable of being drained.

Our forest problems differ in some respects from those of other States. The great danger through soil wash that has been dwelt upon in this meeting is scarcely to be feared by us. The greatest elevation reached probably does not exceed 350 feet. So gradual is the rise passing inland from the coast, and, above all, so porous is the soil and the underlying rock beds that there is not sufficient surface run-off to result in serious wash. Nevertheless, we have our forestry problems. With us the important question is forest perpetuation. Already large tracts have been denuded, and have become alike unpleasant to the eye and unprofitable to the State. Appropriate measures to encourage reforestation are vital to the future prosperity of the State.

In mineral resources, Florida leads the world in the production of that fertilizer essential, phosphate. With present practices it would seem that the entire world is coming at no distant date to the use of fertilizers. The supply of the necessary ingredient, phosphate, it scarcely need be said, has its limits, and, although the Florida deposits will last for many years, yet their exhaustion is but a question of time. Practically all the high grade phosphate now mined is shipped to European markets. Within a generation we shall come to demand that this valuable material remain at home.

How best to perpetuate our forests, utilize our soils, drain our swamp lands, improve our waterways—these are some of the problems on which we seek advice and for the accomplishment of which we are only too glad to join forces with our neighbors and with the Nation as a whole.

FLORIDA'S WATERWAYS

George F. Miles

I have been requested by the Governor of Florida to express to you his sincere regret at his inability to be present at this Conference, which he feels confident will bring about full understanding between the Federal administration and the administrations of the different States as to the necessity of concerted action for the preservation of the country's supremacy in the World of Commerce.

The Governor also feels that such an understanding can not fail to result in harmonizing any differences of opinion which may exist regarding the policy to be followed by the General Government and the Governments of the different States toward the conservation of the country's natural resources.

There is no uncertainty as to the general feeling which prevails throughout the United States that the system at present adopted by some corporations, and many individuals, of marketing everything that is marketable, regardless of the future, should be superseded by a more conservative policy; and where it is necessary for the public welfare that such practices should be controlled by Federal or State administration, the question where the authority to act lies should not be left indeterminate, but should be settled by such gatherings as this, where the minds of the ablest and most influential men in the land have combined for the purpose of dispelling any misunderstandings which may prove stumbling blocks in the path of the general and permanent prosperity of the country.

There seem to be two vital questions to be considered at this Conference: First. Are the natural resources of the Nation being wasted? Second. If so, how can this waste be stopped? The first question has been answered in the affirmative by the experts who have addressed you here, and there seems to be a practically unanimous opinion that some steps must promptly be taken to minimize ~~this~~ waste.

The problem therefore which confronts you is how to do this without interfering with existing industries; but having established the necessity for action, there is little doubt about securing a satisfactory solution of this problem when undertaken by the President of the United States and the Governors of the different States of the Union.

The Governor of Florida desires also to have the attention of this Conference called to the efforts made by his State to develop her natural resources, particularly the attention given to the improvement of the inland waterways and the reclamation of the swamp lands.

Under a contract with the State, the Florida Coast Line Canal and Transportation Company is now engaged in connecting the inland tidal waters along the eastern coast of Florida by a system of tide-level canals, and when the last link now under construction is completed a continuous inland waterway nearly six hundred miles in length will be opened to navigation. Also where the canals referred to were constructed through the marshes bordering the coast, thousands of acres of exceedingly fertile land have been reclaimed and these reclaimed lands are now producing large quantities of fruit and vegetables for the winter supply of the northern and western markets.

Another large drainage project, too, is now being carried on by the Board of Internal Improvement of the State, this work being the commencement of the drainage of that great overflowed section of South Florida known as the Everglades.

This territory is singularly well situated for agricultural purposes, as it has sufficient fall in three directions for effective drainage, and should irrigation prove necessary at any future time the water required for irrigating any, or all, of the three million acres which comprise the Everglades can be supplied from Lake Okechobee, which is located at a sufficiently high level to water all of this territory by gravitation.

This lake covers an area of approximately 1,600 square miles and forms a natural storage reservoir which contains an inexhaustible supply of pure water which will be available at all seasons of the year.

Work is now in progress on the eastern section of the Everglades, and the State has two large dredges in operation cutting canals, one in a westerly and the other in a northwesterly direction, while on the drained lands bordering these canals successful plantations have been established.

In order to show the interest taken by the people of Florida in the use of waterways for transportation purposes, it may be well to state here that the construction of the inland passage along the eastern coast was aided by the State, by the grant of a land subsidy to the company which undertook the construction of the canals necessary to connect the natural channels. The southern division of this waterway was opened to navigation during the Spanish War, and when the Government had some difficulty in securing safe transportation for mortar carriages for the fortifications at Key West, the canal company contracted to deliver three of these carriages at the fort, and did so for $6,500 less than the lowest sum demanded by other transportation lines for the performance of the service. This example of economy in the use of protected water routes seems to be an added argument in favor of the improvement in the inland waterways of the country so strongly advocated at this Conference.

In conclusion permit me to thank you for the opportunity given me to express to you the Governor's regret at being compelled to forego the honor of attending this Conference, and also for the opportunity of presenting a few facts regarding the efforts of the State of Florida to improve and develop her natural resources.

RESOURCES OF IOWA

I. M. Earle

I desire to express to this Conference the regret of the State of Iowa that sickness and death in his family deprives her of the presence on this floor of her brilliant and honored Governor, Albert B. Cummins.

Listening to the florid encomiums of the Governors upon the marvelous resources of their respective States, I am tempted to enlarge upon the riches of Iowa, but will say instead, with becoming moderation, that she was created by the beneficent hand of the Almighty to perpetuate the traditions of Eden.

No rugged mountains within her borders mock the civilizing hand of man. No dismal swamps call for drainage—no arid wastes for irrigation. From river to river, her boundless prairies swell rich and full as mothers' breasts for the nurture of her favored children. Here is the special domain of King Corn of which her adjacent sister States are respectable outlying provinces. Her problem is to conserve for future generations this empire in its virgin fertility—to provide against soil erosion and soil exhaustion, and to gain through improved waterways better and cheaper access to the markets of the world. Local forestry along her streams and steeper inclines will do much to prevent further erosion and yield in time rich returns upon the cost. To illustrate: Three-fourths of an acre of cottonwood, near Charter Oak, thirty years from planting, yielded this year $674 net above all expenses of cutting and marketing. More grass land and more live stock will largely avoid the waste incident to the direct marketing of soil products, and the adoption of more scientific methods of farming will tremendously increase production. Professor Holden's talks on seed-corn, delivered to groups of farmers from the platform of his railway car, resulted in increasing the corn crop of the State the following year by approximately twelve million bushels. Our agricultural college at Ames is giving instruction along the latest scientific lines, and side by side with the young men in her purely agricultural classes are men of 70 now studying for the first time the rudiments of the profession in which they have spent all their lives.

The rivers of Iowa by proper and scientific development through canalization or otherwise, with the great rivers on her borders, will give her, in connection with her splendid railways, all needed facilities for transportation. Her interest in irrigation, swamp land reclamation and forest preservation is that of a patriotic People, deeply affected by all that concerns the national welfare and a People in profound sympathy with the purpose and aim of this meeting.

Sufficient attention has not been given in this Conference to the preservation of the great natural wonders of this country as one of its great natural resources. They are the nurseries of patriotism, which in time of danger is the greatest resource of all. Passionate love of country does not depend on its material riches—patriotism can not be reckoned in percentage. It is well to build battle-ships, but to render them invincible there must be patriotic hearts behind the guns. Back of the steel turret must be the indomitable spirit that rang in the fierce answer of Jones from the reeling decks of the *Bon Homme Richard:* "Surrender? We have not yet begun to fight." Let us preserve all these wonder places of the land that grip the heart with worship and love and loyalty. Let not the father of the future point out to his son the blackened stumps where once stood the giant sequoias of California, and be able only to tell him how much lumber and shingles and lath they furnished and how many dollars it all amounted to. But let him point to their mighty trunks still towering high toward Heaven and say, "My son, these trees were old when the Star of the nativity hung over Bethlehem, old when Belshazzar saw the handwriting on the wall, old when the returning waves of the Red Sea dashed above the doomed chariots of Pharaoh. They are a part of the common heritage of our glorious country. Live for her, fight for her, die for her." Let him not stand with him where once rolled the torrent of Niagara and be able only to point to the barren rock, covered with business placards, or the portraits of eminent statesmen saved to a grateful constituency by some widely heralded nostrum of that day; but let him point with pride and awe to those undiminished waters rolling into the abyss as at the beginning, and standing there by the thunders, the mists, and the rainbows of that wonder place of the Almighty, dedicate him anew to the service of his country!

RESOURCES OF MARYLAND

BERNARD N. BAKER

It is my great pleasure to present greetings from Maryland. In the absence of Governor Crothers, owing to illness, he has commissioned me to represent our State. It is with great regret that I convey the fact of the Governor's inability to be present personally, as his interest in the movement is great, and he could better represent our State.

The very interesting and instructive papers read have produced information and suggestions that will be of untold benefit to our country for all time. The action already taken and that promised by the Governors of the various States is going to do much to preserve our forests, and this will greatly help to solve the question that in my opinion is one of vital interest to all our people, namely, the navigation of our inland waterways.

The sources of supply of our great rivers being permanent, makes it a duty second to none to have these rivers navigable. To accomplish this, our Government must do its part. No nation is doing as great a work as ours in building the Panama canal. Let us go further, and build a waterway navigable for ships drawing, say, twenty feet of water, from the source of the Mississippi to its delta, and of the Ohio from Pittsburg to the Mississippi.

It was on an inland waterway of Maryland, the Chesapeake bay, that the first settlers of this great country founded the colony at Jamestown.

For twenty-one years I had the honor of being at the head of the only steamship line owned by citizens of the United States that successfully competed in the foreign trade with England. Will it be considered improbable when I state that I believe there are before me today some who will live to see steamships leaving Chicago, Kansas City, St. Louis, and even Pittsburg, via the Panama canal, for Hong Kong and intermediate ports, and from Chicago and the Lake ports, via the Mississippi River, to Liverpool and London.

This would open up to our great central West lines of communication so cheap that we could deliver to other countries our manufactured goods in competition with the world.

I am informed that sufficient land would be reclaimed along the Mississippi to more than pay the cost of making the river navigable. One mile of railroad transportation costs as much as three miles of water transportation. Think what this means. Make your own figures, and you will find our central West can successfully compete in manufacture for the trade of the world.

I could and will gladly say more on the question to anyone interested in the purposes of this great Conference.

THE GRAZING LANDS AND NATIONAL FORESTS OF ARIZONA

Dwight B. Heard

PRESIDENT OF THE ARIZONA CATTLE GROWERS' ASSOCIATION

The People of Arizona are naturally greatly interested in a movement which proposes the protection and perpetuation of one of their great natural resources, the public grazing lands, which, under the present lack of control, are rapidly being depleted and losing their usefulness. Today there are pastured upon these public grazing lands of Arizona, according to the latest Census report, which it is believed by the best authority has not materially changed to date, over 630,000 head of cattle, 655,000 head of sheep, and 121,000 head of horses.

Within Arizona we have 12,759,190 acres of national forests, an area greater than the combined area of the States of New Hampshire, Massachusetts, and Rhode Island. Within these Arizona national forests are pastured 108,000 head of cattle, 279,000 head of sheep, and 8,600 head of horses. On the grazing lands within the forests in Arizona grazing is regulated and annual feeding permits are issued at 35 cents per head for cattle, 12 cents per head for sheep, and 40 cents per head for horses. On the public grazing lands without the forests, grazing is free, yet so definite are the advantages of protected grazing within the forests that the cattlemen of Arizona, both large and small, are practically a unit in support of placing the public grazing lands under Federal control similar to that exercised in the national forests.

When the control of the grazing lands in the national forests was first commenced in Arizona, it met with violent opposition from many sources, many stockmen claiming that the prices charged for grazing permits would drive them out of their business; and it is particularly significant that many of the men who were the most violent opponents of this policy in its inception are today among its strongest supporters.

One of the distinctly material advantages to the people of Arizona in the administration of the Arizona national forests is the fact that so large a proportion of the receipts from the national forests of the Territory are expended for improvements or disbursements within the Territory.

In the year ending June 30, 1907, the receipts from the national forests within Arizona from all sources aggregated $173,079.27.

Of this amount 10% was paid to the counties in which the forests are situated, as provided by law, and in addition there was expended within the territory for improvements, such as roads, water development, reforestation, fencing and general operating account, the sum of $81,826.00, which sum plus the amount paid the counties makes a total disbursement within the Territory of $99,134.42, or nearly 60% of the receipts.

In the initiation of such an important policy, it was natural that some mistakes at first occurred. These mistakes have been steadily rectified, and when the law of June 11, 1906, was passed, authorizing homesteads within the national forests, one of the most serious defects in the forest policy was corrected. Since that date over 582 applications for homesteads within the national forests in Arizona have been received, the larger proportion of which have already been acted upon favorably, and homes, that greatest asset of any community, are steadily springing up along the streams within these forest areas.

An appreciation of the clear-headed and efficient handling of grazing within the national forests was shown by the Arizona Cattle Growers' Association at their annual convention held at Phoenix last November, when they placed themselves squarely on record by passing unanimously the following resolutions:

> We, the members of the Arizona Cattle Growers' Association, favor a supervision and regulation of the public grazing lands within this Territory, by the Federal Government through some system which would operate in an equitable, just and proper manner to all of the occupants of the range, and which would not interfere with nor hinder homestead entry at set periods.
>
> We suggest that a fair and just regulation of these public lands can be accomplished by leasing upon a per capita carrying basis, and in the event this method is determined upon, we favor the issuance of leases for periods of not less than ten years. We believe that under any system of Government control the range rights of the present occupants of the grazing area as determined by priority of occupancy and use should be carefully safeguarded, and we urge that in the enactment of such a law for control of the grazing lands, it be provided that no provision of such laws shall affect or in any way interfere with the sanitary live stock laws of this Territory.
>
> Such a supervision and regulation can only be accomplished by the enactment of the proper Federal laws, and we earnestly request Congress to enact such laws.

* * * * * * *

> We express our hearty approval of the practical work of the Forestry Service within this Territory, under the direction of the energetic and capable Chief Forester, Mr Gifford Pinchot. And we believe that the method of handling the question of grazing in the forest reserves in Arizona has secured the practically unanimous support of the cattlemen of the Territory.

In a recent letter received from Mr Chris Ellerbe, one of the most clear-headed cattlemen in the Territory, he states as follows:

> * * * the Federal control of the public grazing lands is a question of greater importance to our country than is the child labor question, or the negro question, or any other problem before our country except banking regulation and the Mississippi river. This question can never be solved with a Colt and a Winchester, but the people who live on the range will keep on trying to reach a solution with the aid of those two "American civilizers." Sheep, by nature and by necessity, are migratory; cattle, by nature and by necessity, become domiciled. Sheep, by nature and by man, go in herds; cattle abhor close herd, nor does their protection demand it. * * * The maintenance of just and fair relations between these two antagonistic interests can only be accomplished by Federal control.

For years the stockmen of the West have had under consideration some form of a leasing law embodying protection and control of the public grazing lands, but until recently they have been unable to agree on any definite measure. This is a big question, and of necessity many honest differences of opinion must occur as to the merit and practicality of this policy. In the past many large cattle interests, some openly, others not as openly, have opposed any public control, favoring a let-alone or stand-pat policy. But realizing that something must be done and done quickly to perpetuate the stock industry on the public grazing lands of the West, the annual convention of The National Livestock Association held at Denver, January, 1908, recommended a definite measure for the Federal control and protection of the public grazing lands by a vote of 396½ to 32½, which, in my judgment, is fairly indicative of the public opinion of the Western stockmen on this important question. At Denver, Colorado, a cattleman in rather homely but convincing and picturesque language, stated: "Give us Federal control of the public grazing lands and more hay and less hell will be raised!"

A bill almost identical with that recommended at the National Live Stock Association at its January meeting, in Denver, has now been introduced into Congress by Senator Curtis of Kansas, and the Arizona Cattle Growers' Association urges passage by Congress of this measure for the following definite reasons:

(1) The marked success of a similar policy controlling grazing on the national forests within Arizona.

(2) The establishment of the stock raising business upon a definite and permanent basis instead of the present uncertain one, this permanency being assured by the prevention of overgrazing and the perpetuation of the natural grasses.

(3) The encouragement under the act to improve the breeding of stock.

(4) The possibility under permanently established conditions to develop and improve the water supply on the range, thus greatly improving its carrying capacity.

(5) The ability to build, under the law, such necessary fences as may be desirable and to create community pastures, a great advantage to the small stockmen.

(6) The assurance that under Federal control the feuds between cattlemen, and especially between cattlemen and sheepmen, which have furnished so many Western tragedies, will be ended.

(7) The absolute elimination under Federal control of the cattle rustler.

(8) The protection in all their reasonable rights of the present occupants of public lands.

(9) The large measure of local control involved.

(10) The fact that all net receipts from each grazing district during each year are turned over to the State or Territory in which the grazing district is situated, for the benefit of the public schools and public roads of the county or counties in which the grazing district is located.

(11) And last, but most important, the assurance that the rights of the homesteader will be absolutely safeguarded, and home-making, that greatest of our national resources, encouraged.

OUR WATER RESOURCES

LYMAN E. COOLEY, C. E.

Our surplus waters are next in value to the land; they are self-replenishing, renewing themselves in the seasons and throughout the years; they are a part of the public domain which has never been segregated, and should be forever held for the use of the People in common.

From the point where they come to earth, in their descent to the sea, they develop energies many times greater than can be produced by high-grade engines from all the coal mined. Through water conservation it should be practicable to realize actual horsepower in excess of what can be produced by all the coal mined in the United States today.

Water conservation demands storage, and 4 to 6% of the area in reservoirs will equalize the flow of streams. By fish culture, such reservoirs will have greater value than the land taken. They add to the landscape, and make places of recreation for the People.

Floods will be abolished or mitigated, thus reclaiming the wealth in alluvial lands along the water courses and making the valleys salubrious. The flow of streams will be equalized and made navigable throughout the year, even to the remote reservoir sites, and by improvement of these natural channels and by connecting the water systems at vantage points, a great transportation agency will be evolved as a complement to our railway system, and as a necessity for our larger growth and complete development.

Forestry becomes the incident of water conservation and makes wealth out of the waste lands which have no better use

Thus through water conservation we may develop power in every region where people can live, and prolong the life of our coal mines throughout the generations; protect from floods, reclaim the wealth in alluvial lands by the water side, and make the valleys healthful; produce a great transportation system, such as is necessary to realize our destiny, and create wealth in fisheries and in forests from land which has no better use. The remedy is far-reaching and automatic, and thus lends itself best to the nature of our institutions.

MISSISSIPPI VALLEY

The Mississippi valley, as a geographic and economic entity, spreads broadly out between the Rocky mountains on the west and the Alleghany mountains, the Niagara frontier and Hudson bay on the east, and extends from the Gulf of Mexico to the northern ripening limit of barley and the potato. It has a general breadth of 1,300 miles and a general length of 2,100 miles, and an area of 2,765,000 square miles, or more than that of all Europe.

In recent geologic time a greater Lake Winnipeg spilled its waters across the northern divide to the Mississippi at less than 1,000 feet of altitude, and the Great Lakes also spilled their waters across the Chicago Divide at less than 600 feet of altitude; and these ancient outlets define the lowest continental lines and the base routes for a waterway system. These three basins, in their present drainage, comprehend 72% of the area of the Mississippi valley, the remainder being distributed in three remnants of direct drainage to the Gulf of Mexico, Hudson bay and Mackenzie river.

The economic or potential value may be estimated in terms of the average humid territory of middle latitudes. Making due allowance for the semi-arid region, the sterile rock of the northern highlands, and the margining out in value toward the barley and potato limit, the equivalent value is taken at 2,000,000 square miles in round numbers. This is five times or more the combined areas of France and Germany, and will carry a population five times as great, or 450,000,000, and perhaps double on an ultimate development.

The Atlantic, or Eastern Division, comprehends an area of 885,000 square miles, with a value of 600,000 square miles. The Pacific Division, west of the Rockies and north of Mexico, comprehends an area of 1,480,000 square miles, with a value of 540,000 square miles. The total area of the three divisions is 5,130,000 square miles, with a value of 3,140,000 square miles. Of this total the Mississippi valley represents 54% in area and 63% in value.

If a sea margin be set off comparable to that for the Atlantic and Pacific, the Continental interior is the larger half of the total value, more than four times Germany and France together, with its margins farther from the seaboard than the most remote sections of either of the countries named.

CONTINENTAL INTERIOR

The four countries of Northwestern Europe contain 18,920 miles of improved waterways in an area of 449,000 square miles, ranging from 1 mile of waterway for 26 to 29 miles of territory in France and Germany, to 6 miles of territory in Holland and Belgium. The waterway development in France and Germany proceeds on the basis of about 1 mile of waterway for each 25 miles of territory, while the railway development, largely under State control, represents 1 mile of railway to 8 miles of territory. Already certain sections of the United States have a mile of railway for each 4 to 6 miles of territory, with a population density of one-fourth to one-third.

Take any unit area in the Continental Interior as the combined area of Illinois, Wisconsin, Minnesota and Iowa, an area greater in natural resources with better topographic conditions than either France or Germany. Such an area in its domestic traffic, in its relation to other unit areas, and in its connection with the seaboard, will require some three times the railway mileage that would be required were it margined by the sea, like France or Germany.

More than one-third of the commodities moved by rail cost less than one dollar per ton at the point of production, more than half are under two dollars per ton, while about two-thirds are worth less than five dollars. To develop the dormant and ultimate resources of the Interior is utterly hopeless under such conditions, nor can such area maintain world competition with more favored nations.

THE WATERWAY SYSTEM

The Interior can not go to the Sea, but for all practical purposes the Sea can be carried into the Interior. The Continental base lines can be developed for ships if we like, south to the Gulf, east to the Atlantic, and north to Hudson bay, and each unit area, like France and Germany, will lie along a virtual sea-front.

Great tributaries and the many laterals can be improved and connected at vantage points in loops and circuits, and the wealth in either valley slope may thus interchange and gravitate to the common artery.

The Mississippi valley has some 25,000 miles of waters which have been actually navigated. On the basis of France and Germany, this should increase to 80,000 miles for the potential area. With such a waterway system 250,000 miles of railway should be sufficient to meet the needs of a population of four to five hundred millions in the Mississippi valley. The greater efficiency of American railways and the larger scale of a waterway system will discount any superior activities of our people.

Considered as a matter of cost, the combined system will be far less, and considered in relation to results, the wealth to pay for the same will be far greater.

CONCLUSION

The typical American of the generations to come will express the environment, the boundless opportunity, and dominion over Nature, in the Mississippi valley. This Interior is the assembly ground of all the divers types of the Aryan race that swarmed from the parent stock in Central Asia thousands of years ago. Coming through many lands with widely varying climatic and soil conditions, strange experiences, and multiplied heredities, they are to here coalesce in the final race type.

Here the genius of the race may flower and mature its fullest fruits, secure behind broad margins of ocean boundary from the alien race wars which rolled our ancestors up like a scroll. Here may develop a civilization such as the world has not seen, and issue forth through its ocean portals to dominate the world.

THE LAKES-TO-GULF WATERWAY

Isham Randolph, C. E.

The venerable and honored Chaplain of the Senate, when he invoked the Divine blessing on this wonderful human assemblage, borrowed from the treasury of Holy Writ that wonderful description of the Promised Land, found in the VIII Chapter of Deuteronomy, and applied its glowing language with unerring fitness to our own land. Our fathers' God and ours gave them a goodly heritage, and we their heirs possess it.

Three million six hundred and two thousand nine hundred and ninety square miles, omitting our Insular possessions, is ours to transmit to our posterity, not robbed of its wealth, but richer for our trusteeship, preserved by our foresight, and bettered by our fostering care.

Although we have multiplied and replenished the earth, we and our living children are but few in the land compared with its possibilities.

Great Britain has in her home island domain only 121,230 square miles, with an average population in 1900 of 312½ per square mile. In that same year we had about 22 inhabitants per square mile. Our most populous State, New York, with its Empire City, had in that year only 147½ people per square mile, and Pennsylvania, next in greatness, had only 139½ per square mile. Our rich and powerful Illinois had only 85.1 people per square mile. When we multiply as the English, Scotch, and Irish have done in their little Islands, we shall be over eleven hundred million people. Are we less prolific than they? What is the answer? Whatever the answer, we know that the generations following after ours will be as the sand upon the seashore for multitude, and that if we begin now to save for them the wealth of earthly good we are wasting and to build wisely for our heirs, we will be none too soon, even if we start today. They will be a trading people, and traders must have transportation. Private capital has possessed the railroad industry, but the streams and rivers belong to all of the People; let us improve them for all of the People.

I am a son of old Virginia, and proud that I should have sprung from that historic soil, but I have been adopted by her most glorious daughter, Illinois, and right loyal am I to that adoption.

To her I have given the best years and the best efforts of my life, in doing the things which she has bidden me do.

She said, "Build me a waterway," and with the loyal, skillful help of brawny, brainy men I have done that which Albert Gallatin, the great Secretary of the Treasury, recommended in 1808. Ever since then the statesmen and the engineers of this Government have nibbled at the project of a waterway across the Chicago Divide, but until Chicago said, "I will," nothing was done. Our Imperial City of the mid-continent has riven a channel through the great rock reef which separated the Lakes from the Gulf, and today she offers to our common country 37 miles of deep waterway which will float any ship that plows the waters of the Great Lakes.

This greatest waterway that man has yet built has cost $56,615,014.44, and it has been proffered by the people who paid for it to this Government for eight long years, as a free gift, and that proffer has never been withdrawn. The National Government makes no move in this great project, but the State of Illinois is astir and for herself and all her sister States she proposes to save this situation. Her Constitution forbids her giving money in aid of railroad or canal building, but so great is the need for carrying on the work of building this waterway that her Legislature has passed a bill submitting a constitutional amendment to the People which will permit the State to make a bond issue of $20,000,000 to carry on the work.

This amendment will be voted on this coming fall, and it will carry. Our Governor is a waterway man; he seeks renomination; he is for the bond issue. His enemies—and he has them; every strong, courageous man has enemies—are for the constitutional amendment; and so these warring elements, on that one issue, are marching under one banner to a common victory.

The United States Engineer Corps, under Congressional authority, made a survey and report upon this waterway.

They viewed it from the navigable standpoint only; the scope of their instructions precluded a larger view, and as a waterway only they reported upon its practicability and cost.

The Legislature of Illinois made provision for an Internal Improvement Commission. Of that Commission I have the honor to be Chairman.

Using the data obtained by the Army engineers as a basis, we are now engaged in working out this waterway problem on lines which will produce water power as well, and although our work is still incomplete, I tell you confidently that we will evolve a better waterway and save the water-power, the waste of which would be an economic crime.

Water power development is the corollary of the waterway. The high dam of the water power makes the long deep pool of the waterway, with wide channel and slow current, ideal for navigation.

The pent-up waters as they escape through the turbines pay a potential ransom for their freedom.

It has been said, "The mill will never grind with the water that is past," but so long as there is declivity to the waterway there may be other and yet other mills, and the water which has given its power to the first mill goes on to the next and the next with equal potency, its energy unspent and inexhaustible. For every unit of water power developed a unit of coal may be set apart for service in those places to which nature has denied the boon of water power. The mechanical efficiency of water power may safely be taken as 80% of its theoretical efficiency. The efficiency derived from coal is seldom in excess of 10% of its theoretical potentiality.

I may be permitted with this introduction to halt in my discussion of the waterways and say something about the Illinois coal fields. I am indebted to Mr A. Bement, of Chicago, a mining expert who has devoted much time to the research which enabled him to give me the figures I now present under the head, first, of known coal areas of Illinois:

Coal beds	Square miles	Thickness in feet	Tons
Very thick	674	9	6,211,584,000
Thick	3,883	7	27,833,344,000
Medium	12,546	4	51,388,416,000
Thin	10,184	3	31,285,248,000
Unknown	10,199	1.5	15,665,664,000
Total	37,486	----------	132,384,256,000

He presents further an estimated additional quantity of coal:

Coal areas	Square miles	Estimated thickness in feet	Tons
1	674	6	4,141,056,000
2	3,883	4	15,904,768,000
3	12,546	3	38,541,312,000
4	10,184	1	10,428,416,000
Total	27,287		69,015,552,000

The sum total of Illinois coals is therefore 201,399,808,000 tons. The chart of American coal fields just issued by the United States Geological Survey assigns 35,600 square miles to the Illinois coal fields, and estimates the tonnage as 240,000,000,000. The area reported by Mr Bement exceeds that reported by the Geological Survey by 29,173 square miles, but he reports nearly 39,000,000,000 less tons of coal. I will leave the coal fields, and return to the waterways, about which I have a knowledge of my own.

Illinois is now fighting a desperate battle to wrest from "predatory wealth" the rights which belong to her children and their children's children; and she must win.

I brought the facts in this case to the knowledge of my Governor, and he appealed to our great Secretary of War to intervene and protect these navigable waters of the United States. The Secretary of War arranged for a hearing of the parties in interest. Governor Deneen directed me to attend this hearing on behalf of the State of Illinois. This was had in the office of the Secretary of War on February 23, 1907.

The people who had laid hold of this waterway were represented by a Congressman of the United States, an attorney, who talked so well that he satisfied the Secretary of War that it was not a matter on which he could interfere, as, in the view which he accepted, it was wholly a question for the State of Illinois. I had not then seen the ordinance of July 13, 1787, entitled "An Ordinance for the Government of the Territory of the United States northwest of the Ohio River." Article IV of this Ordinance reads, "The navigable waters leading into the Mississippi and the St. Lawrence and the carrying places between the same shall be common highways and forever free as well to the inhabitants of the said territory as to the citizens of the United States and those of any other States that may be admitted to the Confederacy, without any tax impost or duty therefor."

This article was incorporated in the first Constitution of Illinois when she was admitted to the Union in 1818.

We shall win in this case and again will be verified the saying, "Peace hath her victories more renowned than war," for it will be a victory for all the people for all the time to come. Our cry is, "Stop all waste of natural resources." No one of Nature's gifts is more recklessly wasted than is the gift of water. Of this there is enough for all the year around in all the years, if we would save the excess of supply and store it for the season of drought. We are beginning to do this, and we will follow up these beginnings by systematic, intelligent work. The spring rains and the melting snows must not be allowed to "flow unvexed to the sea." They must not go down our valleys in wanton flood carrying destruction, devastation to crops and the works of men's hands, but they must be garnered for use when the land is athirst, as Joseph gathered the fruits of Egypt's plenteous years for the years of famine.

This principle applies not alone to the headwaters of our inland streams but to our Great Lakes as well. Nature or Nature's God made those vast reservoirs, and the natural conditions make them easy of control. There should be international coöperation for the construction of the works which shall govern the outflow from the Great Lakes with an ease and certainty akin to that which governs the outflow from any artificial reservoir. The water of these Great Lakes is needed for the use of that fresh-water fleet which is the pride of all our People, and mitigates the mortification which we feel when we contemplate the high seas, upon which we have no merchant marine. But the waters of the Great Lakes are needed for another waterway, that great waterway from the Lakes to the Gulf.

Of that waterway the ship-masters of the Lakes are jealous and distrustful, not because they object to it as a waterway, but because they fear that any water taken from their inland seas for that purpose will tend to shallow the channels between those inland seas and diminish their carrying capacity. There is enough and to spare for them and us. Give us half of the wasted water and, as demonstrated by results, they would never know that the Lakes had been tapped by an artificial drain.

This Lakes-to-Gulf waterway is a beneficent project in many ways; the natural resources of our land can be put to no higher use than the conservation of the health and preservation of the lives of the human race, and this waterway is instrumental in its work on those lines.

The Sanitary and Ship canal, the first link in this waterway, has been in service ever since January 17, 1900, and the statistics of our health department show a saving of 16,299 lives in the intervening period, directly traceable to the reversal of the flow of the Chicago river from the lake. The enemies of the proposition say that the people of Chicago are protecting their own vitality at the expense of their neighbors. The truth of this charge has been tested by a litigation extending over a period of six years, perhaps the most costly and exhaustive legal contest ever carried on in our courts. The testimony filled eight printed volumes of 1,000 pages each. The Supreme Court of the United States, in an opinion handed down on February 19, 1906, by Mr Justice Holmes, decided in favor of the Sanitary District. The self-purification of running streams as illustrated in this instance is indisputable and conclusive.

The Illinois river is a food producer; its fish crop is second only to that of Columbia river, and it affords occupation and support to numerous people. On the authority of the Illinois Fish Commission, I can state that since the introduction of the waters of Lake Michigan the fish crop of the Illinois river has increased in quantity and improved in quality. Formerly in extremely hot summers the water became so stagnant and so foul that the fish died in great numbers and became a nuisance and a stench along the banks. Since the turning in of the lake water nothing of this kind has occurred; there has been a sufficient and steady flow for the support of fish life, and the stream has been wholesome and comparatively cool.

The Lakes-to-Gulf Waterway is therefore a conservator of the health of more than two million inhabitants. It provides a navigable waterway of untold value to the whole People. It produces a water power which will relieve the demand upon the coal fields, and so prolong the period of that supply. And finally it adds to the food supply of the Nation by fostering fish culture and productiveness.

All of these things it does, and it has not yet adversely affected lake navigation, and with intelligent conservation of the now waste waters of these inland seas it never will, even though the draft upon them be double that which the needs of sanitation and inland waterways now seem to demand.

PLANS FOR CONSERVATION

HENRY RIESENBERG

OF INDIANA

The several States of the Union, and the United States itself, are the owners of natural resources of vast value. These consist of farm lands, timber lands, minerals, waters, and waterways. Their development is a matter of deep concern to the Nation and to the States, involving enormous expenditures and inestimable returns. Though of sectional interest by reason of their location, their complete utilization is fundamentally beneficial to the country at large, and possible only with its cooperation. An attempt at development on the part of the separate States must be local, incomprehensive, and inadequate. These efforts must cease at the State boundary lines, although a full realization of results may be attained only by obliterating political divisions. In no other way can comprehensive, intelligent work be accomplished. Not only is an individual State impotent, but its policies and expenditures may be open to the control of interests ignorant, selfish, or corrupt. National development is possible only by a national agency, whose policy it should be to realize on behalf of the Nation a development of its own natural resources and those of the States. This will necessitate a cooperation of all the States of the Federal Government and, whilst in no sense a believer in the theory of a centralized government, I do believe that the time has come, as so ably pointed out in recent addresses delivered by President Roosevelt and Secretary Root, when the principle should be recognized and absolutely insisted upon that the property rights of the individual are subordinate to the rights of the State, and the property rights of the State subordinate to the rights of all the People of the entire Nation.

In view of this principle, then, I advocate that all natural resources owned by the States should be merged with those owned by the United States, and as a consummation of the groundwork of such a plan, I propose the following method of procedure, the same being based strictly on business principles, viz:

(1) That the Governors of the various States and the Secretary of the Interior of the United States prepare a schedule of the natural resources belonging to each, this to include lands, forests, minerals, waters, and waterways.

(2) After such a schedule has been prepared, that the President of the United States be empowered to appoint an Appraisal Commission to determine the value of such resources, and after such appraisal, the several States, and the Federal Government as well, to be given credit for the several amounts allotted by this Commission.

(3) That the National Congress create a Department, to be called "The Department of Natural Resources and Public Works," whose head shall be a member and the executive of a Commission to include the Governors of the States of the Union, each of whom shall act as Commissioner from his State, to serve during his term of office, ex officio and without compensation other than the payment of expenses, for the administration if the above-named resources. In this Department shall be merged the Forest Service, Mines and Minerals Bureaus, Reclamation Service, etc., etc. This Department and Commission shall control the development of all natural resources such as lands, forests, minerals, water powers, and the improvement of waterways, and shall also direct all such works as irrigation, forestation, reclamation of swamp lands, and other similar enterprises.

(4) It shall be the duty of Congress, if requested by the Commission, to issue bonds against these natural resources in order to carry out and develop the plans promulgated by the Commission to conserve our national resources.

As, in the course of time, it becomes necessary to sell lands that have been reclaimed, both by drainage and irrigation, to cut and sell timber, to mine and sell coal and other minerals, to develop and sell electrical energy derived from water power, thereby insuring a vast income to the Department, it is suggested that the Commission should, annually or biennially, direct to be paid to the several States and to the Federal Government the income thus received from such sales, minus the expenses of operating the Department, paying to each State a proper and pro rata share according to the appraised value of the natural resources turned in by each to the general stock.

In this way a comprehensive policy for the conservation of our natural resources can be formulated and maintained at no expense to the General Government nor to the States, as the income derived from the intelligent development of the resources will pay for the exploitation of the same, and, in addition, will return handsome dividends on the investment, to say nothing of the vast and incalculable benefits derived by every person living in this country.

FORESTRY AS RELATED TO MINING INTERESTS

JOHN B. ATKINSON

OF KENTUCKY

Kentucky, with 40,400 square miles of territory, 1,500 miles of navigable rivers, 15,000 square miles of coal lands, and 20,000 square miles of forest, stands second to none of the great commonwealths of the Mississippi valley in its possibilities.

As yet its coal fields have been but lightly touched, and we safely count on 200,000,000,000 tons of coal to be won by present methods of mining—enough to supply the whole United States with its fuel for 450 years, at the present rate of consumption.

While our coal fields are barely touched as yet, we can not claim this for our forests. In Kentucky the oaks, hickories, tulips, gums, chestnuts, maples, beeches, sycamores, ash, elms, walnuts, etc., grow to a perfection equaled in but few States in this country of ours. Only in Tennessee, Missouri, and Arkansas perhaps can the variety and value of timber be found to equal that of Kentucky.

With half the State still occupied by forest, and with the knowledge that almost every part of this is reached by the logger or the saw-mill, it is difficult to estimate now how much oak or other lumber is still available. Enormous drains have been made the past few years, and it is well known at the great hardwood markets that the quality of the oak sent to market is very inferior to that of a few years ago. Smaller trees are cut, and timber is sent that would then have been refused. One of the largest mill owners in the State remarked to me a few days ago that probably not over 10% of the oak received at the mills could be used as quarter-sawed oak. Some years ago this same gentleman filled an order from the United States Government for 50 winter-cut white oak sticks 16 x 16 x 52 feet long. It took a large tract of country then to furnish this bill. Now probably but few counties could produce such timber. How few of us know the length of time it takes for nature to produce such trees! In Hopkins county the average age of 31 white oaks, grown to a diameter across the stump of 12 inches, was 105 years. The youngest tree of the lot to reach 12 inches was 75 years old; the oldest one of the lot was 312 years.

Twenty white oak trees, with an average diameter of 28 inches at the stump, gave an average age of 204 years. The youngest tree was 149 years, with a diameter of 24 inches; the oldest tree was 312 years, with a diameter of 36 inches. But five trees of this lot were 30 inches in diameter and upward.

For a number of years I have kept count of the ages of various trees when cut, and deduce the following:

It takes 105 years for a white oak in a forest to grow to 12 inches in diameter; black walnut will require 56 years; Texas red oak, 58 years; Spanish oak, 66 years; black locust, 45 years; the hickories, 90 years; blue ash, 76 years; sweet-gum, 62 years; tulip or yellow poplar, 50 years.

To discover what nature can produce in the way of a forest in Kentucky, I selected the finest tract of timber I know in the State (and it is in Hopkins county), measuring off three selected acres each 200 by 217 feet. Taking only trees 24 inches in diameter and over, I found the first acre had growing on it 35,860 feet b. m., as follows:

	Feet
White oak	11,354
Black oak	13,756
Sweet gum	9,450
Sour gum	800
Poplar	500

A total of 19 trees. The largest tree on this acre was a white oak containing 5,780 feet b. m.

The second acre gave 49,628 feet b. m., as follows:

	Feet
White oak	31,128
Black oak	4,000
Poplar	7,700
Sweet gum	5,300
Hickory	1,000
Ash	500

A total of 21 trees. The largest tree was a white oak containing 7,016 feet b. m. of timber. This tree would cut a log 82 feet long. A second white oak on this acre 72 feet high would cut 5,512 feet.

The third acre gave 50,146 feet b. m., as follows:

	Feet
White oak	13,446
Black oak	18,300
Sweet gum	11,100
Elm	3,500
Ash	1,500
Hickory	1,400
Poplar	400
Sour gum	500

A fourth selected piece 300 feet by 100 feet, or nearly three-fourths of an acre, gave in 14 white oak trees, 49,198 feet b. m.; 3 black oak trees, 10,570 feet b. m.: a total oak growth over 24 inches diameter of 59,768 feet b. m.

The mining company with which I am connected has a large estate in mining lands which are timbered as well. Coal mining in Kentucky requires quite three feet b. m. to each ton of coal won. Less than one-third of this would be commercial lumber, the props, with some other timbers used in mining, being made largely from timber unmarketable.

Care is taken in cutting mine timbers that the growing trees are injured as little as possible—no trees less than 24 inches in diameter are cut unless showing signs of decay.

Estimating the annual growth of the forest at 55 cubic feet per acre, of which but 15 cubic feet would be commercial lumber, it would take 6,000 acres of forest to produce the three millions feet b. m. of timber needed to mine one million tons of coal and maintain the forest perpetually, which is our object.

To still further provide for the future, my company since 1898 has planted over one million of black walnuts—one-third on 127 acres of farm land, the other two-thirds in vacant places in woodlands.

During the past three years 120,000 catalpas and 110,000 black locusts have been planted on 325 acres of farm land. All these young forests are cultivated for three years, and all are under fence. It is the intention of this company to plant trees on 50 acres to 100 acres yearly in the future—a very modest effort to replace for the future the many millions of feet of timber used by the mines in the past.

In addition to the above, 10,000 tulip trees have been planted out since 1900.

The catalpa and locust trees are planted 8 feet by 8 feet, the tulip 10 feet by 10 feet, the walnuts 4 feet by 4 feet.

The catalpas and locusts are nursery grown; the walnuts are planted where the tree is expected to grow. The tulip seedlings are carefully taken up from the forest and transplanted in shaded moist ground in July.

We heard on yesterday much about the enormous waste of fuel in the coal mining of the past, as well as of the great loss of life in the coal mining industry of the present. Both these statements are correct. While the loss of life in the coal mines of the entire country now means seven lives to win one million tons of coal, there are exceptions to this, especially in Kentucky.

One Kentucky company producing more than one-seventh the output of the State sacrificed in the past ten years but one life in the winning of 1,100,000 tons of coal. This same company markets full 75% of the coal in the veins worked.

While there is much improvement in mining coal today compared with the past, there remains much to be done; first, to reduce the death-rate; second, to reduce the amount of coal that is left in the mines; third, to plant trees when possible, to furnish in future the needed timber for mining operations.

Where timber lands are owned by the miner or operator, begin today to conserve them. Do not wait for the Nation or the State to begin forest preservation. It is patriotism of the highest order for the individual citizen, the individual corporation, to do this.

THE FORESTS OF MAINE

Edgar E. Ring

STATE FOREST COMMISSIONER OF MAINE

The total area of Maine is 31,500 square miles, or only 1,200 square miles less than all the rest of New England combined.

Of this area about 21,000 square miles, or two-thirds of the total area, is woodland. The State of Maine, in common with all other States owning large tracts of timber lands, made the mistake of not holding them, but sold them; so that now only about 150 square miles or one three hundred and fortieth of its wild lands is owned or controlled by the State, the balance by private ownership.

There are 428 incorporated towns, 20 cities, 73 plantations and 443 unincorporated townships. The latter are covered with forests.

The climatic and soil conditions of Maine make it peculiarly well adapted to the growth of a large number of valuable trees, particularly pine and spruce. While it is true that much the larger part of the old growth pine has been cut, there are still many hundreds of million feet of second growth of a size suitable for lumber standing in our forests today.

Careful estimates made in 1902, taking each town by itself, showed that the stand of spruce on the different watersheds of the State was in excess of 21 billion feet, or one-third of the entire stand in the United States. The trees were figured at a size of 12 inches on the stump, at the swell of the roots. Nearly all of this timber is located along the different river systems and is very accessible to market, no logging railroads ever having been used in Maine. From observations and studies made by the United States Forestry Department in 1902 it was estimated that the annual growth of spruce in Maine under ordinary conditions would equal 3½%. This being the case the spruce forests of this State, by economical cutting, will stand a cut of 743 million feet annually without depleting the supply. As the annual cut is about 750 million feet, it will be seen that if fires can be kept from our forests there is no great danger from a spruce famine in Maine at present.

It is undoubtedly true that on some of the river systems spruce is being cut somewhat more rapidly than the annual growth, but taking the State as a whole, with the present forest fire laws in force, and with the more progressive method of economical cutting and preservation of the smaller growth, which is rapidly superseding the old wasteful methods of lumbering, Maine will be able to produce annually at least 700 million feet of spruce (of a size 12 inches on the stump) for many years to come.

In addition to the spruce and pine, immense quantities of cedar, hemlock, and the various kinds of hardwoods are distributed everywhere throughout the State. Of the hardwoods, except the white birch, which has developed into a very important industry in the manufacture of spools and novelties, very little has been utilized up to the present time. As these different varieties of woods are very valuable, it is only a question of time before they will be utilized and made profitable to the State.

While careful and economical cutting is being observed by the larger land owners, there has been a tendency in recent years in some of the southern counties to strip the lands, in the desire for immediate returns, and to the great injury of the owners and the water powers upon which the forests largely depend. As a result, some of the people of that section, realizing the great value of their forests to the State from a commercial standpoint, the preservation of its valuable water powers, and the general utilities of public interest, asked for a law at the last session of the Legislature to prohibit the cutting of spruce and pine of a size below 12 inches at the stump. There was considerable opposition to this measure, many of the members believing that such an act would be unconstitutional. As a result, an order was passed by the Legislature asking for an opinion from the Supreme Court of Maine as to the constitutionality of a law to restrict the cutting of trees on the wild lands of the private holders, in the interests of forestry, the preservation of water powers and rainfall, and the general utilities of public interest in these domains; the substance of which opinion is that it is entirely competent for the Legislature, by statutory enactment, reasonably to regulate the cutting of trees upon such lands.

> The principal reasons that could be advanced against the passage of such an act are the guaranteed right of "acquiring possession and defending property," and the provision that "private property shall not be taken for public uses without just compensation."
>
> There are two reasons of great weight for not applying this strict construction of the constitutional provision to property in land: First, such property is not the result of productive labor, but is derived solely from the State itself, the original owner; second, the amount of land being incapable of increase, if the owners of large tracts can waste them at will without State restriction, the State and its People may be helplessly impoverished and one great purpose of government defeated.

It is very probable that as a result of this opinion a law will be passed at the next session of the Legislature to prevent the "skinning" of woodlands in Maine.

The value of the pulp and paper product in 1905 was given at $22,951,124, an increase of about 60% in five years. The number of pulp and paper mills in Maine in 1905 was 37, and since that time a number have been added. The capital invested in this industry amounted in 1905 to $41,273,915; the average number of men employed being 7,574, and the wages paid amounting to $4,052,919, making the pulp and paper industry take the first rank in the varied industries in the State, that position having been held five years before by the cotton manufactories.

The lumber and timber products, including planing mills, were valued in 1905 at $17,086,699, an increase from 1900 of about 43%; 12,968 men being employed, and the wages paid amounting to $5,894,559.

Maine has a "forest fire" law which has been tested for about five years and it has been found to work very satisfactorily. Under this law about a dozen "Chief Forest Fire Wardens" are appointed, located in different parts of the State, and there are about 200 Deputy Wardens who work under the Chief Wardens. These men are kept at work only when it is necessary in a very dry time, hence the system does not cost as much as it would seem at first thought. The State appropriates $20,000 annually for the prevention and extinguishment of forest fires, and the land owners expend as much or more.

MAINE'S WATER POWERS

In 1867 a scientific examination of the water power of the State was made by order of the Legislature, and the following facts were ascertained: There are fourteen river systems, the four largest of which are the Penobscot, 160 miles in length, with a drainage area of 8,200 square miles; the St. John system in Maine is 117 miles in length and contains 7,400 square miles; the Androscoggin system is 110 miles in length, area 2,750 square miles; the Kennebec, 145 miles in length, area 5,800 square miles. The other systems are smaller but still important in the development of the State.

The mean height of the surface of the State is 600 feet above the level of the sea. Careful computations made show that these rivers in their descent to tide water yield a net force of upward of one million horsepower, equivalent to the working energy of over thirteen million men, laboring without intermission from year's end to year's end.

Maine contains more lake surface than a million square miles of the United States situated in the central and west central districts and south of the lake belt, not including the lagoons connected with some of the rivers which are not properly lakes. There are 1,568 lakes located within the State boundaries, with an area of 22,000 square miles. There is one lake to each 20 square miles of territory and one square mile of lakes to each 14 square miles of territorial area, and the high elevation above tide at which many of the highest lakes are held is a circumstance of great importance as regards water power.

The Rangeley lake at the head of the Androscoggin is 1,511 feet above the sea level; Moosehead lake, 40 miles long, is 1,023 feet above the sea. To show the comparative elevation of these lakes with other lakes in the United States: Lake Itasca, at the extreme headwaters of the Mississippi river, is elevated only 1,575 feet, or little above the height of Rangeley lake. Lake Superior, 1,800 miles by river from the ocean, is elevated only 630 feet or about two-thirds the height of Moosehead lake. Lake Winnipiseogee, in New Hampshire, is but 501 feet above tide, or 500 feet below the large lakes at the head of the Penobscot. So our lakes hold their water in a state of great and unusual reserve power—power that is given forth as the water falls to the sea along the courses of our rivers.

It has been found that the average rainfall in the State is 42 inches, which is distributed with remarkable uniformity at different seasons of the year. The practical consequence of this in connection with other climatic features is that the rivers of the State, to a remarkable extent, enjoy immunity from those ruinous drawbacks to water-power manufacturing, water dearth and freshet, and as the storage basins are becoming more developed and used for a summer reserve, the inconvenience resulting from these drawbacks is being gradually lessened.

Gov Nelson Dingley in his address to the Legislature in 1874 said:

> It is, however, when the magnificent water power of Maine is considered, that this State stands forth the first in the Union, and presents resources which when developed will make it second to no other. Indeed, few, if any, portions of the earth's surface approach Maine in the extent, volume, momentum, and constancy of its water power. One thousand five hundred and sixty-eight lakes, at an average elevation of six hundred feet above the sea, form the headwaters of five thousand one hundred and fifty-one streams, which go rushing down towards the ocean, creating over three thousand water powers, which afford a force measured by not less than one million horsepowers, and equal to the working energy of thirteen million men. When it is remembered that not a thousandth part of the water power of the State is as yet harnessed to machinery, some faint idea of the almost boundless extent of our manufacturing resources may be obtained.

THE CLIMATE AND SCENIC ATTRACTIONS OF MAINE

The climate and scenic beauty of the State of Maine are of unsurpassed loveliness and grandeur from the first of May to November.

Its healing springs and its healthful and invigorating atmosphere are a distinctive feature. Statistics show Maine to be the coolest in summer of any State in the Union. There are a multitude of places where cool breezes blow, where there is no enervating humidity and where the thermometer does not register above the seventies.

There is no place in the wide world which equals Maine in this respect, for while in a straight line the Maine coast would have a length of but 300 miles, it has by its hundreds of deep coves and bays, sandy beaches and rocky headlands, an actual sea wall of 3,000 miles. Every foot is scenically beautiful and made cool by copious draughts from melted icebergs, which form the Arctic current that flows around Cape Sable in Nova Scotia, thence along the Maine coast until it joins the Gulf Stream. But it is not by its seacoast alone that Maine offers attractions to the world; the great extent of her forests, seven times that of the famous "Black Forest of Germany" at its largest expanse in modern times, wherein the States of Rhode Island, Connecticut, and Delaware could be lost together and still have about each a margin of wilderness sufficiently wide to make its exploration without a guide a work of desperate adventure, and the great abundance of moose and deer therein, the multitude of lakes, ponds and streams teeming with myriads of fish, her beautiful rivers—Nature's great highways from the mountains to the sea—her geographic position almost precisely equidistant betwixt the equator and the pole, variable winds, nonperiodic rains, the entire absence of a single dangerous animal, venomous reptile, or poisonous insect, all combine to make the State of Maine altogether the most delightful place to be in of any among the galaxy of States that make up our glorious Union.

THE CONSERVATION PROBLEM

Chase S. Osborn

OF MICHIGAN

The problem of the conservation of the raw materials of our country is by far the most important question before the people at this time, even more important than that of a larger navy or of the tariff.

The questions of the tariff and of the navy are artificial. If we are going to waste our raw materials prodigally and indiscriminately, there will be no need for a navy; and if we are going to waste them, a tariff wall as high as Sirius would not avail to keep us on an equality with those peoples who have richer raw materials than we have.

The great menace of Japan in the near future is not one of war, but of commercial and manufacturing competition. No country in the world since America has gotten a good start has been able to compete with us in many directions, because we have had more natural advantages than they possessed. All this may be changed in the next quarter of a century or less. At the doorway of Japan, in Korea, Manchuria, and China, there are as many untouched raw materials located conveniently with reference to transportation as we have in this country, possibly excepting forests. These great deposits of raw materials, consisting of coal and iron ore and other useful materials, have been conserved by what may turn out to be a superstition divinely applied. That odd and incomprehensible belief in Feng-Shui among the Chinese has operated to conserve the riches of the earth for many centuries, even if it has caused the Chinese many tremors and much useless expense to appease the demons of the sea and the sky. All these have been paid for and more by the treasures they have not wasted on account of their superstition. Japan will sweep Feng-Shui aside just as it has its Samurai and its methods of yesterday. It will attack the riches of all countries adjacent to it if possible, and will acquire materials that will enable it effectively to enter directly into manufacturing competition with us.

But there is no argument needed to convince those who have thought upon the matter of the necessity for at once inaugurating a policy of wise conservation of our forests, soil, coal, iron ore, water powers and other natural wealth. The great question involved is as to how this can best be done. We shall have to originate ways and means of our own, and we shall also have to borrow from the ideas of older nations. Probably the most important single object of economy is that of the forests. They are more important than iron ore, because if the 60% ore is used today, the waste piles containing the 40% ore can be attacked tomorrow. If the coal goes in a few centuries, and we conserve the forests and water power, we will have fuel in the form of wood and electricity, not to mention the possibility of stored solar heat.

The questions of economy in classes bear such relation to each other that they are frequently dependent upon each other. If we conserve the forests we are insured rainfall, and the streams of the country will take care of the various water powers, as well as navigation and irrigation supplies. I am not one who thinks it is too late to begin this work. A century ago we had all forests and few farms. We could not have both forest and farm. The one has replaced the other to a wholesome degree. I do not think the forest equilibrium has been dangerously disturbed, but it is high time that the matter be looked into, lest we go too far before we call a halt and begin restitution and recuperation.

In many portions of our country, and in other lands, nature seems to have provided for the conservation of forests by locating vegetation at places where it can not profitably be assailed for commercial purposes, or does not grow to a sufficient size to be commercially valuable. In the Alps this has made for a high Alpine growth that will never be much disturbed, and has been of the utmost importance to the Rhine, Danube, and other basins. In the Rockies, Cumberlands, Alleghanies and all the mountains of the United States, the same is true to a degree. Nevertheless we shall have to assist this natural provision and it can be done.

We can do nothing without an aroused public interest. If we can ourselves, and can influence our fellow citizens also, to realize in just what degree they are trustees for future generations, in that measure will success attend our efforts at conservation. If our forefathers had wasted all of our natural riches in a mad race for wealth, we could not remember them as reverently and gloriously as we do. If we rob our children and our children's children of those things which nature must have planned to have been theirs, we will leave the heritage of a curse rather than of a blessing. The things we have before us today, given of God to man, are in the nature of a temporary loan. We are to use them wisely and not too rashly or carelessly destroy, and to do our best to replace that which we have consumed.

I have sometimes questioned whether commercial and moral conditions that permit a man in a single lifetime to accumulate an hundred million dollars, even honestly, out of the soil, are rightful conditions.

It is a question whether a man has a moral right to destroy the riches of the earth, no matter how they have come to his hands, with the purpose of gaining more than he can eat and be comfortable with and be responsibly helpful to those about him. But that is probably another question, even though it may indirectly bear upon the problem of raw material conservation. This is an ethical rather than a legal problem, but we shall have to deal with sentiment and ethics and so harmoniously unite them with law in this matter of conservation that it is not irrelevant to speak of them here.

Suppose a farmer had a section of land; suppose that at first it was covered with forest, as has been the case in the past in many instances; and suppose that he cuts all of this timber off and sells it for what he can get for it, probably delaying the last day by manufacturing some of it; and then suppose that he goes on raising the crops that are easiest raised and most profitable for a short time, until he has wasted the substance of his soil. In all of these years in which he has been carrying on this policy he has accumulated wealth, but in the last analysis he will have a wasted farm and nothing to eat but money. Of course he will have money with which to buy elsewhere, but where will he buy? We are today not only supplying our own people with foodstuffs, but the products of our farms find their way to every corner of the earth, giving cheaper and more wholesome food to all peoples. It is estimated that in Italy today half the people are underfed, and Italy is not a nation below the average.

We, as a nation, are the farmer with the section of land—only if we cut off all the timber it will give a more direful effect than that attending the removal of the timber off the single section, because a single section would not influence in any appreciable degree the rainfall, or the storing of the water in the soil to be released slowly and helpfully. But if we cut down all of the forests in our entire country, the results will be serious indeed. Just as it is with an individual, so does a nation waste in proportion as it accumulates beyond its needs. I will not say that our manner of attending to our farm work as a nation is bad, but I will say that it can be made better.

Our agricultural colleges could be encouraged even more than they have been. They are turning out the young men who are supposed to conserve our greatest interests, while the manual departments of other universities are turning out the young men who are to destroy them in manufacturing and otherwise.

Much splendid reclamation work by irrigation and drainage is going on all over the country, and the tendency of the times, although stimulated largely by selfishness, grows better all the time. If we can awaken the morals of our people to the pitch where they will work to accomplish things because it is right to do so rather than because of selfishness or acquisitiveness, or at least to work because of all these reasons, much will have been accomplished.

I am not prepared to suggest any profound or rigid plans, but with the belief that it is better to suggest something on an occasion of this kind than nothing, I offer the following:

1. That an association be formed with members from each State, for the purpose of carrying out the objects of this Conference.

2. That a practical working commission within this association be formed.

3. That this commission shall take up the work of inaugurating the study of practical economics in the public schools of each State, as well as in the higher schools and universities. "As the twig is bent, so is the tree inclined." That the study of simple agricultural methods and soil conservation be taught in the intermediate grades below the grade of the high school.

4. That laws regulating the size of timber that the private owner may cut be considered. In other countries there are laws preventing the cutting of timber under six inches in size. It may be considered advisable to decrease this two inches and make it unlawful to cut down trees less than four inches in diameter.

5. Special attention should be given to the taxation of forests. There are those who most reasonably contend that the forest is a growing crop and should not be taxed until ripe or until harvested. Such an arrangement would encourage the propagation of forests generally that are held by private owners. At present, in many instances, timber lands are so highly taxed that their ownership is a burden and the timber is cut to escape the burden of its taxes

6. That laws be considered bearing upon the question of requiring every farmer in the United States to keep a wood lot of reasonable size where trees will grow.

7. To consider the wisdom of requiring farmers and other land owners to keep trees growing on all their fence or other boundary lines. If the farmers in the walnut section of America thirty years ago had planted walnut trees along all of their fences, the country would be many millions of dollars richer today than it is.

8. That adequate fire laws be passed in every State in the Union and that persons cutting timber be required to pile and burn their brush, instead of permitting the debris to accumulate and dry on the ground as a menace to all neighboring property. In Michigan there has been more forest loss by fire starting in old slashings than from any other cause, and this is probably true of other States.

9. That a special study be made of the cause and prevention of soil erosion, and that the results be distributed throughout the schools and otherwise to the People of the country.

10. That consideration be given to the vast undeveloped coal deposits of eastern Kentucky and contiguous area, with a view, if legal and possible, to creating a Government reservation in that region.

11. That water powers be declared the property of the State or Nation, and that persons using energy of this character shall be required to pay a proper rate for it. It seems preposterous and grotesque that the waters accumulating over the entire United States in all of the natural channels, by simply passing one point where there is a break in the topography of the surface shall become the property of the person owning the land immediately adjoining. This may have been so engrafted in our laws and perpetuated so long that it will be difficult to correct.

If we can bring about such of the above things as are wise, and more that better minds will suggest, and then if we can teach our children to be intelligently economical and not foolishly miserly, we shall have made a big start in a profitable direction

CONSERVATION FROM THE VIEW-POINT OF RECREATION

William H. Black, D.D., LL.D.

PRESIDENT MISSOURI VALLEY COLLEGE

The arguments for the conservation of our natural resources have been chiefly utilitarian and economic, though one speaker considered it very wisely from an esthetic point of view—the preservation of our natural scenery.

I do not wish to minimize any consideration which may be advanced for the guarding of our People against waste and final impoverishment. But, in addition to what has been urged, I direct your attention to the recreation feature of the question.

Game and fish are very important to the food supply of the nation. The depletion of the forests, along with other conditions, has reduced enormously the game fields—that is, the places where game thrives and reproduces itself normally. The denudation of the watersheds, the soil wash which colors our streams and fills up the beds of our rivers (and which is most serious in the spawning season), has reduced the fish supply most seriously The best kinds of fish can not live in muddy streams. It is highly important therefore that watersheds and shore lines be reforested in the interests of game and fish supplies.

ARMOUR
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So far, the argument is utilitarian. But hunting and fishing are our finest forms of recreation, and thousands of lives are bettered by the open air, the change of scene, the mental excitement, and the good fellowship of hunting and fishing. Does not our President enjoy the chase, and did not Mr Cleveland angle with delight? And who would take such refreshment from those who live the strenuous life? It will be a sad day when men can neither hunt nor fish. Woe to the nation which lacks pure, wholesome, healthful recreation! As we provide playgrounds for our children, so should we have hunting and fishing grounds for the men. I do not put this on so high ground as the utilitarian or economic, yet it is quite important to the health and efficiency of thousands of our fellow citizens who work at high tension, in dim offices, for long hours. Reforestation means more game. The clarification and sustentation of streams means more fish. These two together mean more food and in greater variety. They mean also the prolongation and efficiency of many valuable human lives—the recreation of thousands of fagged minds.

WATER RESOURCES

HENRY B. KÜMMEL, Ph.D.

STATE GEOLOGIST OF NEW JERSEY

In the wise conservation of our natural resources, as in all lines of human achievement, knowledge is power. Accurate knowledge of the character and extent of our resources is necessary to their full development and conservation. In a few words I wish to outline the scope and accuracy of the knowledge of its resources which my State of New Jersey has. I will spare you details and figures, and will speak solely of our water supplies and water powers.

We have accurate and detailed knowledge of the area and character of every watershed. We know the elevation of every stream and of every point upon that stream from its source to its mouth. We know the location of every site for reservoir and dam. We know the size, location, and general character of every tract of forest land in the State. The amount and distribution of our rainfall has been accurately recorded. The actual flow of our streams, in flood and in drought, has been measured. Our supplies of potable water, both surface and underground, have been carefully determined.

The amount of water power now in use has been accurately measured. Precise and careful estimates have been made of that capable of development, as soon as there is a demand and economic conditions permit. New Jersey has taken account of stock in this as in other questions relating to her natural resources.

But do you ask me what we have done with our knowledge? I say in reply that we have put it to practical use. Our honored President in his opening address to this Convention called your attention to the words of Justice Holmes, of the Supreme Court, confirming a decision of our Court that the People of our State had the ultimate control of the waters of the State. Under the supervision of a State Commission provision has been made for the control, conservation and distribution of our potable waters for the benefit of all. Through the cooperation of the Secretary of the Interior, plans have been adopted which will necessitate the expenditure of seven millions of the State's money in the construction of reservoirs to prevent floods, to increase our water powers, and to furnish pure water to our people. Under another State Commission we are purifying our streams and correcting the errors of earlier years. Forest fires have been very largely prevented under the active work of our efficient system of fire wardens, and the young forest will hereafter be given a chance for its life. Private owners of forest lands have been interested, and effective cooperation between individual and State established.

Three hundred thousand dollars have just been appropriated for the improvement of our inland waters for purposes of navigation. You have perhaps all heard of the New Jersey mosquito. Let me tell you that our Legislature has authorized the expenditure of $350,000 for ditching and filling our marshlands along the coast to exterminate this pest. Let me add that this money is being wisely and effectively spent; that the mosquito has been exterminated in the regions in which this work has been done, and that in ten years the mosquito will be as rare in New Jersey as the buffalo is today on the plains of Kansas and Nebraska.

Much has been said and must be said of the necessity of conserving our national resources. New Jersey has realized this; New Jersey is realizing it in increasing measure every day; New Jersey will do its share.

METHODS FOR CONSERVATION

R. O. Richards

OF SOUTH DAKOTA

It is with great reluctance that I venture to address this intellectually alert and august body, composed of picked representatives from every State, called here at the instance of the President for the purpose of conferring as to the best means to pursue to conserve natural resources, that is by promoting the prudent use and by directing scientific development in utilization of everything for man's well being. The forethought which prompted the Chief Executive to call this Conference augurs well for the progress of civilization and the culminating destinies, through man's own efforts, intended by the Supreme Intelligence back of this Universe.

The subject is vast in magnitude and far-reaching in importance and can, in point of details, be but briefly discussed in the short time of three days; and being personally an optimist and only interested in the solution of an effective remedy, if there is one, I shall dwell but little on material details, but more along the line as to a possible remedy, and therefore shall crave your indulgence for introducing a somewhat foreign subject in my remarks, as essential, in my opinion, to any possible cure.

The natural resources are best comprehended by division into three groups—the animate, the vegetable, and the mineral. These three natural resources seem to rank in point of importance to life in the order named; the two former are in themselves self-renewing through the laws of natural selection; the latter only partially so, through man's genius. It would seem there is nothing which can be done to permanently check waste in conservation of the mineral kingdom unless it becomes economically practicable, in which event the waste, of course, is stopped because conservation pays; which principle underlying our civilization acts automatically and will in time develop our waterways if the Government does not act. However, it seems quite possible that before the mineral deposits which are at all likely of exhaustion—for instance, oil and coal—become scarce that the genius of man behind the laboratory and engineering tables will furnish us heat, light, and power from other sources. The conservation and betterment of the animal and vegetable kingdom seemingly little referred to at this Conference must come through the propagation of only the best seed and through scientific selection by breeding, teaching, and planting so that only that which is best suited to promote man's happiest existence is perpetuated. Thus we improve upon natural selection and follow the Scriptural mandate to subdue the earth until we ultimately make our civilization complete by getting the law of environment into predominant operation. The vegetable kingdom is at present well conserved and improved, though there has seemingly been cause of alarm about the forests; but they still continue to grow and decay as they always have done. Even at present much of the windfall and matured timber decays for reason of not being cared for or cut at maturity. There is a time to harvest timber, the same as grain, before it spoils. We must remove to build up, hew down to plant anew, and in proper places.

The axe can be made to trim the thicket of the forest and cut out the crippled shadeling tree, but sentiment and the mandate "Thou shalt not kill" precludes anything but an educational remedy as to man, and man again controls the destinies of all natural resources. The lack of a thoroughly organized and aggressive effort and uniform practical teachings in the public schools leaves defective man still crowding our State institutions and flooding our cities, a charge upon society.

With 18,000 insane, defective, and delinquent persons in institutions of a single State, creating an annual expense of four million dollars and the necessity of building a new asylum for housing 1,200 new inmates as the natural average increase every fourth year; and with an estimate of ten thousand epileptics in the homes of that State, and with 75,000 daily rationed whites in one of the cities of this same Commonwealth during the months of January and February this year, have we not something besides material interests to conserve? It has been stated with great concern that our coal deposits will be exhausted in 200 years, which is alarming; but how will the fair State of Illinois at the present ratio of increase of defectives look to our descendants two hundred years hence with fifty additional asylums dotting its prairies? Is it not possible that our children are the first natural resource, requiring our most careful and immediate attention to remedy all kinds of waste? There can be little doubt but what better paid and better trained teachers, working under a merit system anchoring education along certain lines in the primary grades and high schools, making the attendance at public schools compulsory for everyone, and teaching through the most reliable of our senses, the sight, by the introduction of the kinetoscope into the schools, the fruit of vice and its following inheritance, and thus indelibly impressing the minds of the young, and by teaching ethics, industry, and what goes to make up good American citizenship, and how to conserve himself and his natural resources, will in 25 years obliterate the present tendency of waste in all things. When we produce as nearly as possible, as a Nation, on an average, youths well trained, rugged morally, mentally, and physically, and capable of more than competing with the citizens of any other nation, then our destinies shall be fulfilled and copied throughout the world. We have the resources at present. Why not make a special effort to conserve Man to facilitate his own destinies through cooperation of Nation and State in educational matters generally?

If to the Inland Waterways Commission and the Natural Resource Conference a national educational commission could be added by our thoroughly good and great Chief Executive, whose business it might be to gather data on educational methods from every State and Nation, and compare and seek to detect the present best average citizenship as the evidence and result of that method of teaching, and report its information for adoption as a uniform and thorough primary education, for the general welfare of the People, to every State educational department as a matter of free information, we would accomplish much. We would then be better prepared to meet the future, and as a result in time have plenty of means in each State to develop and conserve its natural resources from the saving in appropriations for charitable and penal institutions now necessary.

The index finger on the dial of time, dealing with the constant and inevitable changes of conditions in the social, political, industrial, and economic, now seems to point to the fact that we are drifting toward a cooperative merit system. In ascending this condition let us be extremely careful in acquiring or husbanding any unnecessary natural resources or performing any unnecessary individual function as a Government, National or State, lest we build a float for the selfish, emotional, and ignorant visionaries to buoy their theories upon. I have in mind the pernicious doctrines which would make it appear possible to promote genuine progress or to receive honest reward without labor in this world, or which absurdly imply that statutory law will change human nature, create personal energy, morality, happiness and intelligence, and lasting prosperity. Permanent social, industrial, and economic development does not and can not come about by enactment of statutory law, but can only come through education and individual effort by development of the spiritual and physical resources at our service. This kind of development may require statutory law as a support in its evolutionary growth, and such law may serve as a temporary assistance to society till the new conditions outgrow the law in an undisturbed natural way; but to those who constantly advocate law as a remedy let me say that law is but temporary while education is a permanent antidote to everything. Let us study and improve and establish a uniform practical standard of primary education and practice our leader's maxim, "the square deal," the synonymous expression of the golden rule, and we shall in a short time act unconsciously above the law and in non-conflict with the law and thereby conserve everything for the happiest existence of every man, which purpose will then become the sole object in working for himself along patriotic lines; and having been taught to curb and harness vanity for practical purposes, full American citizenship will be accomplished and the future of the Republic will be bright in every way.

THE IMMEDIATE NECESSITY FOR ACQUIRING THE APPALACHIAN FOREST RESERVE

JOHN ALLISON

CHANCELLOR CHANCERY COURT, NASHVILLE, TENNESSEE

There is immediate necessity for acquiring and preserving the remaining forests in the proposed Appalachian Forest Reserve.

First. As a necessary means for protecting and preserving for the future the main sources of the water supply for at least one interstate navigable river, viz, the Tennessee, and to "aid to the navigability" of the Ohio.

Second. As a necessary means to preserve throughout the future the existence of moisture for agricultural purposes.

Third. As a necessary means for preventing the destruction of homes, rich bodies of agricultural lands, improvements, live stock, and grain by great and sudden floods.

Fourth. As a necessary means of preserving in these various lesser streams and rivers water sufficient to furnish power to operate industrial and manufacturing plants now located or hereafter located on them.

If the first proposition be successfully maintained, and the Government should acquire the proposed territory, the argument need not proceed further; for when acquired to serve the first purpose the serving of the others follow.

The Associated Press on April 22, 1908, sent out the following from Washington:

> [By Associated Press]
>
> WASHINGTON, D. C., *April 22.*
>
> The House Judiciary Committee today decided as unconstitutional the Lever-Currier bill appropriating $5,000,000 for the acquisition by the Government forest lands in the Appalachian and White Mountain chains for the preservation of stream supply and the regulation of stream flow. The Committee, however, has decided by a substantial majority to report to the House that if forest reserves are an aid to the navigability of streams the acquirement of such reserves by the Government is constitutional. These two conclusions are to be formally promulgated at an adjourned meeting to be held later today.

From this, the House Judiciary Committee concedes the constitutionality of the pending bill if the acquisition of the reserve be made as "an aid to the navigability of streams," but denies the constitutionality of the measure if to be made "for the preservation of stream supply and the regulation of stream flow."

"AID TO THE NAVIGABILITY OF STREAMS"

It will be my endeavor to show that the acquisition and preservation of the forests within the limits of the proposed reservation will not only be "an aid to the navigability of streams," but a necessity to preserve and to secure to future generations the "navigability" of the Ohio and Tennessee rivers, and then to show that, if the measure had no other objects in view than "the preservation of stream supply and the regulation of stream flow," it would nevertheless be within the powers granted to the Congress to appropriate and expend the sum required to acquire and preserve the proposed reservation.

CONDITIONS AND FACTS PRIOR TO 1887

A few well-established determinative facts, bearing upon either side of any controversy, should always outweigh theory or assertions.

Almost every year, sometimes twice and thrice each year for a period of about eighteen years prior to 1887, I was in some portion of that part of the proposed reservation lying between Asheville, North Carolina, and the Virginia State line (a distance of about seventy-five miles), frequently fishing in streams, hunting in the mountains, and occasionally accompanying, in the service of clients, land surveyors.

During this period I had, at one or another time and during all seasons, crossed over the mountain range from the Tennessee to the North Carolina side by way of every road or bridle trail traveled between Asheville, North Carolina, and the Virginia State line; and later I visited parts of the mountain range (lying west of Asheville) to the Georgia State line, which is within the limits of the proposed reservation.

And thus I acquired and had during the period mentioned personal knowledge of hundreds of springs and hundreds of "streams" and of more than thirty rivers which have their principal sources in this range of mountains from the southwestern end of the Blue Ridge in the State of Georgia to the Virginia State line.

These rivers, which flow into Tennessee and which give to Tennessee river at least five-sixths of its volume of water at the city of Chattanooga, are: the Ocoee, Hiwassee, Tellico, Little Tennessee, Little River, Big Pigeon, Little Pigeon, French Broad, Nolachucky, Watauga, Doe, North, Middle and South forks of the Holston. The Clinch and Powell have their source, as does the North and Middle forks of the Holston, in the range in Southwestern Virginia. Some of the other rivers which have their sources within this range are: New River, its sources being in North Carolina and Virginia on the sides of Grandfather Mountain, the base of this mountain being in three states—Tennessee, Virginia, and North Carolina.

New river flows due north to where it forms a junction with the Greenbrier, and from thence it is the great Kanawha until it flows into the Ohio at Gallipolis.

The Dan has its source on the sides of the Grandfather also, but it flows due eastward to a junction with the Staunton, in Virginia, and from thence it is the Roanoke, continuing eastward until a short distance from the coast, when it turns southward into Albemarle Sound.

The Yadkin (of Daniel Boone fame) rises also on the sides of the Grandfather, but parts company with the Dan and flows due south, joining the Great Pedee (whose other sources are in this Appalachian Range). The Watauga has its head springs on the side of the Grandfather in North Carolina, but leaves the Yadkin to go on, in its southward course, the

Dan on its eastward, and the New on its northward, while it (Watauga) starts due westward; four considerable rivers flowing from the Grandfather Mountain toward the four points of the compass.

Other rivers having their sources in this range (within the limits of the proposed reserve), and flowing out through North and South Carolina and Georgia, are: the Great Pedee, Little Pedee, Waters, Broad, Enoree, Johns, Tugaloo, Savannah, Chattahoochee, Etowah, Oostanaula, and other lesser ones not necessary to mention.

With the possible exception of the common center of the upper sources of the Amazon, the Orinoco, and the Plate rivers in South America, it is believed that no other area of like size in the world is the source of as great a quantity or volume of surface water as the proposed area of the Appalachian Forest Reserve; and this surface water, unlike that in South America, flows out into the surrounding States to the four points of the compass, producing and communicating moisture in the many valleys through which it passes to hundreds of thousands of acres of valuable agricultural lands already under cultivation, and finally making navigable rivers.

I understand from the Associated Press report of the action of the House Judiciary Committee on the pending Appalachian Forest measure that a "substantial majority" of the Committee was of opinion that the measure would be constitutional "if forest reserves are an aid to the navigability of streams."

Very nearly the whole number of streams, great and small, before mentioned as having their sources within the limits of the proposed reserve give their waters into interstate navigable rivers.

The Ohio supplies navigation for the States of Pennsylvania, West Virginia, Ohio, Indiana, Mississippi, and Kentucky; the Roanoke for Virginia and North Carolina; the Savannah for South Carolina and Georgia. All of the waters coming from the northwestern summit of the Appalachian Range go ultimately through Tennessee and Ohio rivers into the Mississippi near Cairo; and they make up nearly, if not quite, one-third of the volume of water leaving Cairo in the latter river, which from thence to the Gulf supplies navigable water to the States of Missouri, Tennessee, Arkansas, Mississippi, and Louisiana. All told, these waters, having their sources within the limits of the proposed reserve, furnish navigable streams to the citizens of seventeen States, or more than one-third of the whole number of States in the Union.

During the period of about eighteen years prior to 1887, when I had personal knowledge of conditions in the Appalachian Range between Asheville, North Carolina, and the Virginia State line, the range from base to base was almost an unbroken primeval forest of giant poplar, oaks, walnut, ash, cherry, chestnut, beech, etc.

The ravines, gorges, hollows, and depressions on the sides of the different spurs of the range had lying across them at many different points trunks of fallen and decaying trees, also great limbs and banks of fallen leaves and much undergrowth, all of which served to dam up and hold back the water from heavy rains and from melting snows in the late springs until mother earth might absorb it and then give it back to the surface in the summer time through the hundreds of springs on and along the sides and base of the ranges; and thus nature had created many reservoirs in the mountains in which first to store great quantities of water and then later in the summer to filter it out through springs, clear, pure, and cool, thereby preserving during the summer the surface water volume for the streams and rivers in the valleys.

CHANGED CONDITIONS

After an absence of nearly twenty years, I revisited some parts and some of the streams of the range. My visit was made in the summer season. I remember it well, for it was the summer when he of "Bigstick" newspaper notoriety filled the whole earth with his fame as a peacemaker by bringing Russia and Japan to terms.

In this visit I found conditions very materially changed. Considerable areas near the base of low ranges had been entirely denuded or cleared of all timber growths and put under cultivation in grass, etc., and other considerable areas of the mountain sides and in the ravines, hollows, etc., likewise stripped of the forests, and last, but not least, the reservoirs described had been destroyed by the opening up of logging wagon roads that the wagons might pass up after and then come back down with the logs and lumber. These roadways serve now as a "chute the chute" for the heavy rainfall to rush down and flood the streams. The whole appearance of the face of things had undergone a change.

I found dry holes in the earth where to my own knowledge springs had previously existed, and necessarily found "dry creek" beds; furthermore, it was as perceptible to my eye that the volume of water in some of the larger streams and little rivers was very much less than twenty years before that time, as it was plain to my vision that much of the forest had been removed and wagon roads made where nature's reservoirs had once existed.

In all the years preceding 1898 Tennessee river did not at any time reach a stage below zero on the gauge at Chattanooga, and only twice did it reach a low-water stage of less than one foot above zero, whereas for the ten years following 1898 it was four times at a stage of less than one foot above zero, and on October 25, 26, 27, 1904, it was at the lowest stages in its history—nine one-hundredths of a foot below zero—and navigable this year only 210 days, the year following 240 days, which is the latest data I have. Prior to 1890 the Tennessee was navigable at Chattanooga an average of more than 300 days in each year. The Ohio does not seem to have suffered loss in late years in its volume of summer and fall water, at least not so much as the Tennessee.

If Congress has power under the Constitution to expend money in erecting great dams for the purpose of collecting a body of water, and then in making tunnels and canals to carry the water from this body out into arid or desert lands for the purpose of producing moisture for agricultural purposes where it does not exist, then, by what process of reasoning can it be maintained that Congress may not under the same Constitution expend money to protect the sources of streams already supplying moisture for agricultural purposes?

I would be glad to hear or read the argument maintaining that such power does exist for the one purpose and denying its existence for the other.

I maintain that if such power be vested in Congress for either of such purposes it exists also for the other, and that the Congress having already exercised this power in the expenditures made in the Reclamation Service, it can not now consistently deny the existence of such power for the purpose of preserving the existence of moisture, as well as for the purpose of producing moisture, for agricultural purposes.

Who does not know that moisture is supplied and communicated in the summer season to agricultural lands lying along the sides of perennial creeks, brooks, or streams and rivers? And who does not know that when such streams "dry up," the moisture will "dry up" likewise?

These expenditures by the Government in the Reclamation Service are being made with the view or sole purpose of making habitable arid or desert lands—that is, making homes for its citizens, and not as "an aid to the navigability of streams."

If the Government may constitutionally expend large sums of money to make homes (out of such lands) for some part of its citizens (say 14,000), may it not also spend money to protect and preserve from destruction by great floods the homes of other thousands—homes already made and occupied?

I would like to hear or read the reasoning and argument that concedes the right and power in the Government under the Constitution to do the one and denies its existence for doing the other.

The Statistician of the Reclamation Service has pointed out that $36,665,570 have already been expended, which has furnished land as homes for 14,000 citizens, a cost of about $2,190 to each man, woman, or child of the 14,000 already provided with and settled on homes thus made.

I am not complaining at the cost, for every time the Government makes a home-owner it also makes a patriot.

I do not mean it to be understood that none but home-owners are patriots. I do believe, however, that home-owners and their sons will fight for their homes with more zest than they would for a rented home. So let the good work of making home-owners at the cost of $2,190 for each member of the family continue; but should not the Government protect and preserve homes already made and occupied?

DESTRUCTION OF SOIL AND HOMES—A "PRESERVATION SERVICE"

The gradual inundation in the early spring-time of the low or "river-bottom" lands, of which there are many thousands of acres along the rivers not navigable which flow out of the proposed reserve, is neither hurtful to the soil nor harmful to the crops that are "pitched" later, but, in fact, helpful to both; the alluvium thus deposited enriches the soil, while the moisture which has gone down deep into the earth remains (to produce crops) after the overflow has receded, just as does moisture remain in the soil which has been overflowed by water carried out through the artificial irrigating ditches or channels made and being made by the Government in the arid and desert lands.

The ruin and utter destruction of lands and improvements thereon or along the same rivers, caused by sudden and great floods, is common knowledge.

Such floods are most destructive near the base of the mountain range, where the valleys are the narrowest. The volume of the flood water overflows the banks as it flows on down, and its current or destructive force is thus weakened so that it does but little injury.

The injury, however, worked to the home-owners in the narrow valleys along these rivers has been enormous and irreparable. Not only their homes, barns, fences, implements, all improvements, have been swept away, but much of the soil itself carried off, the currents of the flood-tide cutting deep channels through fields and farms and entirely covering over what is left with rock, gravel, and sand, rendering it worthless; and where there were one day happy homes, with plenty, there was the next day desolation and poverty.

In the spring season of 1901 one of the most destructive of these sudden floods within the memory of the oldest citizens occurred in each one of the twelve rivers that come out of the Appalachian Range into the eastern division of Tennessee.

In this section of the State houses, barns, fencing, gristmills, sawmills, small and large manufacturing plants, railroad bridges, wagon-road bridges, etc., were demolished and the wreckage carried away like chaff before the wind; in the aggregate nearly a sufficient number of acres of the most fertile lands to furnish homes for the 14,000 who have settled on the irrigated deserts were practically rendered worthless.

A friend of mine writing me (a day or so afterward) from Elizabethton, a little city, the county seat of Carter, on Doe river, describing that flood in its approach on the town, said:

> It was the wildest, wickedest, most appalling looking wave of destruction I ever beheld; it rolled down the valley toward the town in a wall, roaring like thunder, and on its crest rolled and tumbled houses, barns, furniture, farm implements, wagons, fence rails, live stock, etc. It spread out as it approached the town, as the little valley widened, but a current several feet deep condemned a right of way down Main Street, flooding residences and business houses, causing incalculable damage.

This letter was written by a cool-headed truthful gentleman.

If this range of mountains be stripped of the remaining forest and its incidents, much of these valleys will thereafter not be habitable.

If the Government may lawfully expend money to make lands habitable, may it not also expend money to keep lands habitable already inhabited? What process of sound reasoning may be used which will justify the use of public funds for the one and yet deny it for the other purpose?

The Government Forest Service has lately published a report entitled: "The Relation of the Southern Appalachian Mountains to the Development of Water Power," in which the present available power of this water is estimated to be 1,400,000 horsepower, the present value of which, at the usual estimate of twenty dollars per horsepower per annum, is $28,000,000 per annum.

Is it worth saving for the present and the future?

COST—VALUE

It may be asked, how much will it cost? I answer, I do not know, for I have not inquired the probable cost of the about seven million acres within the proposed limits of the contemplated reserve. I venture to express the belief, however, that if there was any known method or standard by which we could estimate the approximate present and future value of the remaining forest, the value of the surface water supply for agricultural, manufacturing, and navigable purposes, its cost, as compared with its value in these respects, would not be as one to a hundred; no, not as one to a thousand.

WHAT WASHINGTON AS A STATE HAS DONE AND CAN DO FOR FOREST CONSERVATION

FRANK H. LAMB

WASHINGTON STATE FOREST COMMISSION

Nowhere else has lumber been so potent a factor in development as in the United States. Our millions of homes, the humble though comfortable cottages of the workman, the more pretentious residences of the well-to-do, the mansions of the wealthy, the countless manufacturing establishments, the vast engineering works, more than 200 thousand miles of railroads, and all that goes to make up our modern civilization, have been rendered possible by an abundant and moderate-priced supply of lumber. The absolute necessity of maintaining this supply commensurate with our growing demands is apparent, if our National development is to continue.

A grave question now before the Nation is the proper assimilation of our heterogeneous population. Our urban conditions are not conducive to the future security of the Nation. More of our population must be placed upon the land. The strength of a Nation is in its homes. The smallest country village is more of a bulwark of patriotism and real Americanism than the whole of the East side of Manhattan Island. If lumber becomes so expensive as to rank in cost with steel, concrete, and stone, we will have far greater congestion in the tenements of our cities. The neat frame cottages of our agricultural sections will be replaced by mud and thatch huts. Improvements that would pay dividends, if they could be constructed of lumber, must wait until they warrant the use of a more expensive material.

The various substitutes for lumber have not decreased the per capita consumption, which shows a constant gain from the 342 feet b. m. required in 1870 to 449 feet in 1906. The value of lumber has been rapidly increasing. From an average value at the mills of $11.39 per thousand in 1890 it rose to $16.60 in 1906. Add to this the additional transportation charges, from the fact that today the bulk of our lumber is obtained from the South and Pacific Northwest, and the average value of lumber throughout the country has more than doubled since 1890. This is shown in the case of Buffalo, where white pine worth $18 in 1862 is now valued at $90.

According to population we consume nine times as much lumber as Germany and nearly twenty-five times as much as England. Prosperous villages dot the plains; the railroad penetrates many a remote corner of our Nation; our frontier localities have ten times the comforts and luxuries of civilization because our lumber supply has been unlimited in the past, and in cost within reach of every one.

Our future necessities will be greater than our past requirements. In 1906 the United States manufactured approximately 40,000,000,000 feet of sawn lumber, not counting shingles, posts, piles, poles, miscellaneous wooden-ware and our fuel and pulp wood requirements. Within a decade our railroads must be doubled in mileage to keep track with our other development. It would require 100,000,000,000 feet to duplicate them as they exist today, and it now takes over 30% of our entire cut or 12,000,000,000 feet annually for ordinary repairs and extensions. Shall we sacrifice our $72,000,000 of forest products exported in 1906 and become a lumber-importing instead of a lumber-exporting Nation? These are a few of the questions that depend on the maintenance of our timber supplies sufficient to meet not only the demands of the present but those of the future; and I shall consider the facts as they relate more particularly to the State of Washington.

Western Washington has the heaviest and most uniform stand of timber in the world. It is primarily a forest-growing region; climate, soil and precipitation all are conducive to forest growth, but generally unfavorable to agriculture. If the timber was removed, not over 25% of its area would have any possible value. About 30% of the area of the State, or less than 10,000,000 acres, can be classed as land adapted to forest growing. Originally we had about 300,000,000,000 feet of standing timber in the State; 50,000,000,000 feet has been lumbered, about the same burned, leaving us about 200,000,000,000 feet remaining. This estimate might be increased by closer manufacturing to 300,000,000,000.

The lumber industry of Washington has witnessed a most wonderful development; beginning soon after the discovery of gold in California, its growth was slow until 1880, when new markets were opened in the Orient and the completion of the Pacific Railroads opened the East to our high-grade and special products.

As long as the supplies of the Middle West were adequate to the country's need, the development was gradual, but since 1899 the cut of the white pine States has decreased nearly 50%. This has been made up by the South and Pacific Northwest. In 1860 New York and Maine were the greatest lumber producing States. In 1870 Michigan was far in the lead, Pennsylvania, New York, and Wisconsin following. Michigan maintained her supremacy through 1880 and 1890; Wisconsin in the mean time surpassing New York and Pennsylvania, and in 1890 taking the lead, to be in turn surpassed by Washington and Louisiana in 1906. Nearly every twenty years, therefore, has witnessed the chief lumber supply shifting to another great geographical subdivision of the country. In 1860 the Northeast was the principal producer; in 1880 the Lake Region; in 1906 the South, and 1915 will see the Pacific Coast the chief supply.

Looking forward only a few brief years, will not the Pacific Northwest repeat the history of the other regions? Washington, now cutting over 4 billion feet, will doubtless double her production by 1910. At that rate our supplies would last from 25 to 35 years, but who can estimate the future? Whatever it may hold for us is it not time to consider if some steps can not be taken to prevent the inevitable depletion of the Nation's last stand of timber?

We have in Washington three classes of ownership—the national forests, State lands, corporation and private holdings. So far as the 12,065,500 acres of national forests lying within Washington are concerned, we can rest assured that the object for which they were created, "the greatest good to the greatest number, the future welfare of the forest considered," will be carried out so long as the sentiment of the People remains as it is today. Of the 142,000,000 acres comprised in all the national forests, certainly much less than 50% of the area can ever be classed as forest or forest producing lands. From the experience of European nations we are safe to assume that if these lands were placed under the best possible forest management they would only produce an annual increment of about 300 feet b. m. per acre; this would amount to 13,000,000,000 feet annually, or less than one-third of our present lumber consumption. Therefore, the national forests alone are not adequate to maintain indefinitely our forest resources.

Unquestionably the several States have a duty toward our forests that should not be shunned. Some States have assumed the responsibility even to the purchase of large tracts of land from private owners. It is the opportunity of the State of Washington to assume its burdens on an easy and practical basis.

Congress through its liberality granted to the State of Washington, for educational and other public institutions, about 3,000,000 acres of land. The State has sold approximately 1,300,000 acres, realizing therefrom nearly $7,000,000, and still retains 1,700,000 acres. Of these lands about 800,000 acres are adapted primarily for forest growing or else is covered by virgin timber. As a State we have been true to our stewardship. Our State ownership in timber is worth today probably $20,000,000. We are selling timber lands only as needed in logging operations for fair prices. But the State should go further in the adoption of a definite forest management of its timber lands. They should be segregated from the agricultural lands, appraised as to value, the timber sold only as actually needed and then under conditions that will assure a future growth of timber. Natural reproduction should be encouraged, and timber not removed properly protected.

The natural reproduction of Washington forests varies according to locality. Fir, spruce, cedar, hemlock, our principal timbers, are produced each on different classes of soil and under different conditions. In many cases it is spontaneous, in others special preparations are required. In any event all efforts in this direction are dependent upon the adequate protection of our timber lands from fires.

The destruction of the growth of centuries by the forest fire of a day, without any effort at prevention, is a pitiful commentary on our national foresight. But far more serious than this is the constantly recurring fires that overrun our cut-over lands, causing small present financial losses but absolutely prohibiting the possibility of a future crop of timber on lands otherwise useless. Each year thousands of acres of young growing timber seeded naturally for the benefit of our successors are destroyed, until finally Nature, weary and disheartened, gives up the struggle and only an expanse of charred stumps and eroded side hills covered with worthless brush marks the site of what might have been a future forest.

The Forest Service has accomplished much in the protection of the national forests from fire and the State of Washington, gaining a lesson from the great fires of 1902, when millions of dollars of standing timber, many homes and lives, were destroyed, has taken active steps to prevent a repetition of such conditions.

In 1903 a Forest Fire Law was passed providing penalties for carelessness and willful setting of fires. In 1905 a State Forest Commission, a State Forester and deputies in each county were provided for. In the three years 1905, 1906 and 1907 over $28,000 has been expended by the Commission, of which over $11,000 was contributed by private owners of timber. As to the results, it is impossible to give any values in dollars and cents. The loss in the three years from forest fires, as reported, has been 1,654 fires, burning over 128,000 acres, causing damage of less than $400,000; 6,500 permits for burning slashings were issued and the burning supervised by deputies to prevent loss to adjacent timber. As a State, we are satisfied with the results and doubtless future legislatures will appropriate liberally toward the work, the last appropriation, that of 1907, being $26,000. Offenders of the law have been punished and the moral effect alone has more than justified the money expended. We have posted warning notices in every public place, beside roads and trails, and have educated the people to the fact that the timber has a public value far greater than its value to the stumpage owner.

If we have 200,000,000,000 feet of standing timber it is worth today to the owner an average of $1.50 per thousand, or $300,000,000. If marketed, there would be paid, mainly to the citizens of the State, for labor and materials approximately the following:

For logging and log transportation, @ $5 per M	$1,000,000,000
For manufacture, @ $4 per M	800,000,000
For transportation to market, @ $7 per M	1,400,000,000
Total	3,200,000,000

as against the paltry interest of the stumpage owners of only $300,000,000.

Our private owners are awake to the necessity of forest fire protection; besides contributing to the aid of the State's work, over $25,000 has been expended annually by the larger corporations.

The Washington Forest Fire Association has been organized and its members assessed 1 cent per acre on their holdings. This will maintain over 100 men in the forests during the dangerous months. Therefore I am pleased to report that the State of Washington has taken a very advanced position in forest fire protection.

With the cooperation of the Forest Service, the State, and the timber owners, we expect to protect Washington's forests to an extent unknown in any other State of the Union. Burned and charred stumps will never contribute toward the building of a great Commonwealth.

We could not reproduce our forests in 150 years, and then only at a vast expense of effort and money; but, I think, even with proper fire protection I have shown that these virgin forests will supply our demands only for a relatively short period. Beyond that, if the State is to maintain its prestige it must encourage a reproduction of cut-over lands. The adoption by the State of such a policy will encourage private owners in the same direction.

Our knowledge of forest growth is so limited that no business man can estimate, even roughly, his probable future returns. We need figures as to annual increment under different conditions. We must be shown how to provide for a natural reproduction, and how to protect young growth in lumbering; but we need, above all things, to find some method by which, without interfering with vested rights, we can prevent a portion at least of the enormous waste of our lumbering operations. Of every acre cut in Washington about 35% of its material reaches a market. A large part is left in the woods to decay or to add fuel to some future forest fire. Another large portion finds its way into the saw mill burner, being of so little value as not to repay manufacture and transportation to a market. Anything that will decrease the percentage of waste will not only return millions of dollars to our people but will enable our timber resources to meet the demands for a longer period.

The average value of a thousand feet of Washington lumber in Chicago is $25, of which the value at the mill is $10 and freight transportation $15.

The life and existence of the lumber industry of the Pacific Northwest is absolutely dependent upon freight rates. Recognizing that the railroads are entitled to just returns upon actual capital invested, the lumbermen insist upon the right of adjustment of rates before a proper tribunal. We can better afford to give up to private operation our post office, our matters of taxation, in fact any of the governmental functions that touch us financially, rather than to forego the right to be heard in the adjustment of freight rates.

There is enough forest material wasted annually in Washington to supply 10 million people with the requirements for lumber and fuel, but it will not repay transportation to market. A small reduction in freight rates will send thousands of cars of this wasted material in the form of lath, pickets and cheaper grades of lumber to sections where it is badly needed. A slight increase in our present rates will still further increase our percentage of waste. No governmental policy can change these facts. For these reasons we are vitally interested in the completion of the Panama canal and the improvement of waterways in general. If rail transportation is as low as is consistent with adequate dividends, perhaps water transportation may prove in some cases cheaper.

We need improvements to harbors and waterways. From Government reports the average price of stumpage on Puget Sound is $1.75; on the western coast of Oregon, $1.05, a difference of 70 cents per thousand, due entirely to lack of transportation facilities. The irrigation of the arid regions lying just over the mountains will utilize much low-grade lumber now wasted. All these improvements tend to increase the value of our timber and draw nearer the time when our lumbermen will be able to realize benefits that will accrue through some other policy than the reckless waste of the present. Before, however, we can ever as private individuals hold land as a future producer of a forest crop our policy of forest taxation must be changed. A crop that has only one harvest in a century can not pay annual taxes of from 3% to 4% of its value. The present practice of forest taxation places a heavy premium upon the immediate conversion of standing timber into lumber. A better plan would be a nominal yearly tax and a royalty tax upon the timber when harvested.

It is time we should consider our virgin forests as the result of long centuries of growth and development—a heritage to be handed in part to posterity and not entirely at the mercy of adventurers who have no thought but their exploitation for immediate personal profit.

I hope that I have proven that their days are numbered, that the hour glass is inverted. As surely as the grains of sand will seek the lower level, so certainly is the day coming when these forests, now the wonder and admiration of the world, the Nation's last reserve stock of timber, will be but a memory of the past; when the reverberating sound of the wielded axe and the roar of logging engines will cease to waken the once sylvan solitudes; when the smokestacks of a thousand mills, their days of usefulness past, their machinery gone to ruin, their thousands of busy laborers forced to other fields, will stand desolately forlorn, grim monuments of a past commercial era and a perpetual testimony to the heedless disregard for nature's treasures on the part of her servants. This question does not concern Washington any more than it concerns every other State and the Nation at large. When the forests of the Pacific are gone, where will be found the bountiful supply of timber to supply our National needs?

Whatever has been done to conserve our forests has been done by Executive proclamation; Congress has done nothing and will do nothing until an aroused public opinion forces its members to forget their own selfish interests, their business associates, their clamorous constituents who are looking for the Nation to give them 160 acres of timber or some other contribution from the national resources that belong not to any one State or locality, but equally to every citizen of the Nation. The homesteader who makes two spears of grass grow where one grew before is entitled to encouragement to the extent of free land, but under our land laws the lottery-like disposition of our resources has only bred a species of subsidy-seeking, graft-encouraging, perjury-promoting public spirit that has pervaded every department of our public life.

Shall we see our children stripped of everything provided by a wise Providence for the sustenance of untold generations? The earth does not belong entirely to the present. Posterity has its claims.

FOREST CONSERVATION

Hu Maxwell

OF WEST VIRGINIA

Ten million acres of forest cover the West Virginia hills. Indispensable as those forests are for the growing of timber, their chief importance does not lie wholly in that direction. They hold the destiny of the Ohio river as a carrier of commerce. Drainage basins in many States help to supply the Ohio's channel, but the substantial part of its water must come from the wooded mountains of West Virginia. From that region it will pour down in destructive floods if the steep slopes are laid bare, or it will flow in moderate and steady stages if the forest cover is maintained as it should be. The rainfall will not materially increase or diminish, no matter to what extent the ground may be covered or denuded, but there will be a tremendous difference in the manner in which the rainfall will seek the sea. With forests, today's precipitation will reach the rivers during the following weeks. Without forests it will be in the channels, and overflow them tomorrow.

Thus far, the West Virginia forests have escaped the excessive exploitation which has denuded so many other parts of the country. Many mountain summits and many slopes have been stripped by axe and fire, but we have, as yet, been spared the wide and utter desolation which has been visited upon many regions of the United States.

One-fourth of the forest tree species found in America between Mexico and the Arctic ocean grow in West Virginia. In variety it is not surpassed by any region of like size. The Canadian flora creeps southward along our mountain tops, and the trees of the warm South creep northward through our valleys, while the forests of the Atlantic States and of the Middle West meet and mingle on our mountain slopes which face every point of the compass, catch every wind that blows, and partake a little of nearly every climate found in the United States.

Happily, the West Virginian is not yet under the necessity of going before the country empty-handed and with the despairing cry that we have wasted our inheritance and must be saved from the consequences of our own improvidence and folly. We have been wasteful, it is true; inexcusably wasteful and thoughtless in many ways, and particularly so with some of our resources. But nature gave us so much to start with that, in spite of waste and extravagance, we have as yet barely touched the hem of the garment of our aggregate natural wealth.

It would profit little, however, to file an inventory of what we have, if we did not show a willingness to use it wisely for the good of others as well as for ourselves. Ownership does not imply a right to destroy, although that has been a belief all too common in the past. "After us the deluge" should not be a doctrine followed by sensible men. Those who persist in following that teaching ought to be restrained by whatever force may be necessary to meet the emergency.

Statistics are often dry and meaningless, but there is no dryness in a statement of what the rivers of West Virginia have done and are doing for the country, and what the forests may do for the rivers. The Monongahela river, which receives its water in our State and flows across the line into Pennsylvania, is one of the largest carriers of inland commerce in America. Perhaps, as a carrier of freight which originates on the banks of the streams which transport it, the Monongahela stands absolutely first among the rivers of the whole western hemisphere. Yet its navigable length is only 131 miles. It transports annually a larger tonnage than is carried by the thirty-eight navigable streams of the

United States flowing to the Pacific ocean, with 1,600 miles of water; more than the fifty-three rivers, with 5,000 miles of channel, emptying in the Gulf of Mexico—the Mississippi not included. In fact, a broader statement than this is true, for the Monongahela's annual tonnage is greater than that of all the rivers of the United States flowing to the Pacific ocean, all flowing to the Gulf of Mexico—excluding the Mississippi—all flowing across the line into Canada, added to the entire tonnage of the Missouri and all its tributaries—10% more than the tonnage of all these combined. The forested mountains of West Virginia send down the water which moves this enormous commerce.

The Kanawha river of West Virginia is a vast freight carrier also, though as yet it is of less importance than the Monongahela. It is, however, of no less importance in supplying water to carry the commerce of the Ohio. Without the water from the Kanawha and the Monongahela, the Ohio would sink to an insignificant place as a carrier of commerce, and without the forest cover on the West Virginia mountains, those two valuable tributaries would be dangerous because of excess of water at one time, and useless for want of it at another. Complaints of floods and droughts are already heard; and as the forest destruction spreads to wider areas, the floods will become more violent and destructive, and the droughts more frequent and more severe.

In the days when streams of emigrants moved from the Eastern States to the West, seeking for agricultural lands, the mountains of West Virginia were passed by and rejected as of little value. But a century later it is found to be another instance where the stone rejected by the builders becomes the chief of the corner. Our mountains do not and never can abundantly grow corn and wheat. They are rough and steep and cannot compete with the level and fertile West in growing grain; but they grow forests that yield place to none, both pines and hardwoods, exceeding in number more than one hundred species, and some of them attaining their highest perfection there. It is because of their forests, and because of their steepness, that those mountains furnish water, not only for the development of power with possibilities almost too great for estimation, and to carry the commerce of the Ohio, and to a considerable extent of the Mississippi as well, but they supply the best that goes down the Potomac for the good of Maryland, Virginia, and the Nation's Capital.

In working out this country's vital problems of using and saving, we of West Virginia believe that we are giving as much as we are asking. Ours is not a narrow or selfish view of this great work. The natural wealth which happens to lie so abundantly within and beneath our narrow valleys and our everlasting hills is not looked upon by us as a State asset alone, but also as national wealth. We understand that to get the best use of it we must share it, and help others while we help ourselves.

To that extent and for that purpose we look on State boundaries as mere lines in mathematics, having length and position, but no breadth, and offering no obstacle or hindrance to the development and exchange of wealth.

SUGGESTIONS ON THE CONSERVATION OF COAL

JAMES W. PAUL

CHIEF OF DEPARTMENT OF MINES OF WEST VIRGINIA

Governor Dawson, in his speech before this Conference, proposed that I be heard on the question relative to some of the methods which might be adopted to prevent waste of our resources—more especially coal.

I fully appreciate the signal honor given my State when the President designated Dr White to address this Conference of Governors on the subject of the waste of our natural resources. Dr White has so well presented his subject that I do not feel called to add anything to that which he has said, but in response to the Governor of my State, I will, in a brief manner, make a few remarks upon the means and methods that, if adopted, would lead to a conservation of our coal deposits.

First. From the discussions that have been presented, it is quite evident that among men eminent in science and in business there is a diversity of opinion as to the probable life of the present known coal deposits of the country.

Second. In view of this diversity of opinion and judgment, it only emphasizes the importance of the necessity of securing tangible and definite data concerning the unnecessary waste in the extraction of our coals and other minerals.

Third. The question of how such waste may be curtailed involves, first of all, an investigation along scientific lines of the present methods. This naturally commands the thought and work of the trained engineer, and to secure the data necessary the work should be wide in its scope.

Fourth. There are conditions under which some beds of coal will yield 90% and others 70 or 80% of the entire product, which may be extracted economically with safety and with profit. These conditions should be made known to all engaged in mining that they might profit thereby.

Where large percentage of the coal bed is left within the mine, it should be left in such a condition as to dimension of pillars and ribs that future generations may be able profitably to reopen and reclaim the coal.

There are many mines where a large percentage of the product is successfully obtained in its mining, and while these are in the minority, through the proper educational work and the assistance of legislation many more mines could be benefitted.

As to what might be done in an effort to correct this national evil, it would be well for the Federal Government to take up the work of making such investigation as would enable the publishing of those conditions under which the greatest percentage of coal may be obtained economically and with the greatest safety to the labor employed.

The Government could well afford to lease coal lands on the public domain, requiring the deposits to be worked in strict conformity with plans prescribed by the Government's experts on this subject, and the results published.

The States could profit by this experimental work and formulate laws requiring that a given tonnage per acre for any particular coal should be produced, and the placing of a tonnage tax on any deficiency.

Equally, if not more, important with the conservation of the coal is the conservation of the health and life of the labor which produces the wealth stored within coal.

It is hoped that the Government may continue the work begun by the technologic branch of the Geological Survey, to demonstrate the extent to which different kinds of explosives are a menace to the lives of mine workers.

SUGGESTIONS ON THE CONSERVATION OF SOME OF OUR RESOURCES

Edward Gillette

STATE TREASURER OF WYOMING

The proper conservation of our natural resources along the Rocky mountains and the plains adjacent thereto is a subject for deep thought and the exercise of our best judgment.

After thirty years' experience in this region as a surveyor and civil engineer, beginning with making of topographical maps in the Government service, and then locating several thousand miles of railway, extending into every State and Territory of the Rocky mountain section, it is difficult for me at the present time to imagine the cause of the great neglect of our Government in permitting the destruction of its forests to go unchecked for so long a time.

To illustrate the above, Government survey parties in some years were unable to perform their triangulation work for entire seasons owing to the smoke from extensive forest fires, and up to recent years these fires were allowed to burn until extinguished by the winter snows.

Large areas of continuous forest are very undesirable, as a fire once started is liable to continue to burn until all the timber is destroyed; fire guards, therefore, are a necessary precaution. The ground in most of our forests is covered with pine needles, sometimes to considerable depth, in various degrees of decomposition, and camp fires built upon this ground are particularly dangerous, as this soil burns and it is difficult to extinguish the fire. The loss of much of our timber in the past is attributable to these conditions. I have seen a fire started on the vegetation or peat of a dried-up swamp burn for three months and defy all efforts to extinguish it until there was a heavy fall of snow. The fire will travel beneath the surface for considerable distances and break out in fresh places several days after one thinks it has been entirely subdued.

From personal observations, I believe that our Forest Service, by extinguishing fires in their incipiency, has saved more timber in recent years than has been consumed in a commercial manner. It is to be regretted that our Government was so extremely slow in taking any precautions whatever to save the thousands of square miles of timber which have been destroyed by fire during the period before the Forestry Bureau took charge of our forests. The greatest menace to our forests today is from fires, and the danger increases as the square of the size of the timbered area. The preservation of our forests from destruction and waste depends more upon protection from fire than any other thing. This is the case at present and will be for many years to come. A large forest fire can destroy a million dollars' worth of timber in a day; this has been done in the past and is liable to be repeated at any time in the future. The waste in this particular depends entirely upon the precautions taken to avoid fires and prompt action in putting them out when once started. A burning forest not only destroys the timber, but frequently consumes the soil composed for the greater part of vegetation. In thus destroying the soil reforestation is impossible, while the dirt, which acts as a sponge or reservoir to retard the flow of water, is replaced by rock which causes a mountain torrent and dry creek bed to take the place of a continuous flowing stream. Mountains well covered with soil even without timber make continuous flowing streams in the valleys below, so that the country can be peopled. Trees, therefore, densely covering the mountains are a menace to the soil as well as the timber. The destruction of the soil renders the valley below uninhabitable, which would have remained habitable had no timber ever been grown upon the soil. I live in a section of the country which is thickly settled, but if the soil was eliminated in the mountains all values would be practically wiped out and this region be depopulated.

This condition is referred to in order to illustrate the fact that to conserve our forests it is imperative to avoid forest fires, and also that on account of the fact that the damage caused by these fires reaches much further at times than the simple destruction of the timber. It comes pretty near being the case that where the forests are preserved from fires, it preserves all the values in the surrounding country which have as their basis the water flow of the streams. We must also not lose sight of the fact that hundreds of lives have already been sacrificed through forest fires. The care of our forests involves greater responsibility than is ordinarily realized, and this work can not be too thoroughly performed. It can and should be done, however, in a manner agreeable to the people living near these forest reserves, as they will always be the ones most vitally concerned in the proper care of the forests, and they will be glad to cooperate so far as possible in upholding every reasonable rule or regulation of the Forestry Bureau. It is assumed that the officers of this Bureau, at least those who determine its policy, are men of superior intelligence and gifted with more than common sense. If such is the case, it looks as though no friction should be created which would not be quickly removed.

There are some features of our forest administration which require consideration. The Government charges, for example, two dollars and a half per thousand feet as a stumpage fee; private owners of the forest lands immediately raise the price correspondingly of their private holdings. In one State alone 36,000,000,000 feet are given as being in private ownership with an annual cut of 1,000,000,000 feet, an extra profit is thus made per year of $2,500,000, and an increase of $90,000,000 in the value of the holdings.

It is a fact that owners of large tracts of timber in the West have marked up the price of their holdings many hundreds of millions of dollars on account of the charges made by the Government. Consider a large owner of timber paying the Government a few thousand dollars for stumpage on what public timber he cuts, and marking up the value of his private holdings millions of dollars. The People, of course, have to pay for it, and the cost is very burdensome at present. The more the Government charges, the greater the profit to private owners. This added value has already assumed proportions almost beyond one's comprehension. It has been stated that "low price of timber means neglect and waste." It is also true that the low price means more use, which is the chief value of this product, or any other for that matter.

The preservation of our forests is endorsed by all the People of the West, and it appears that some policy could be adopted to obtain their hearty cooperation in this business. The importance of this subject is great enough to require our united action, and every effort should be made to this end. If good judgment and a recognition of the influence of the rules adopted upon the welfare of the present generation be exercised, especially as to those living near the forest reserves, no ill feeling would be engendered, but a hearty cooperation be established, which is a consummation devoutly to be desired.

Our coal supply can be greatly conserved by encouraging the use of water power as much as possible and the securing of a greater amount of heat from the coal consumed. The consumption of more of the gas in the coal will probably soon be realized and enable us to secure several times the present amount of heat units obtained from the coal. Water power is the most economical of any on account of the fact that no water is consumed, there being the same quantity left for domestic, irrigation, or any other purpose. Nothing should be charged for this power beyond a nominal rental. The water power is sometimes owned by States or individuals who control the flow by means of reservoirs, and arrangements in these cases could easily be made with the owners. The water for domestic and irrigation purposes should always have the preference over that for power purposes.

In regard to the Government leasing land for grazing purposes a serious problem arises. Land which was thought fit for nothing except the native grasses which it produced is now raising fine crops by what is called dry farming. It has been ascertained that irritation of the soil is equal in effect to that of irrigation. Large quantities of land are now being settled upon in the arid region, water is being conserved in places unthought of ten years ago, and with the introduction of plant life requiring the least amount of moisture a wonderful production is assured. It has been already demonstrated that it is only a question of a comparatively short time before all of our arid lands will be settled upon and cultivated. To enter upon any extensive system of leasing land for range purposes would be going backward instead of forward in our development, and discourage the conservation of a large quantity of water which now goes to waste.

In the conservation of our resources a great effort should be made to secure the best results from the brains and muscles of our People. Corporations having policies which do not command the loyalty of employees or the good will of the public cause great waste and detriment to the conservation of our resources. Everyone is damaged thereby. It seems that some men, particularly bright and intelligent in certain features of their business, are almost totally lacking in being able to adopt an ordinary common-sense method in other particulars equally essential, with the result that great waste is caused in all material, and in addition the best efforts of the employees are not obtained, and the records of the business consequently do not show anywhere near as good results as should be secured. This is very unfortunate for the owners and the people especially, who in the end are obliged to sustain much of the loss, and no good is obtained by anyone. Every concern, as a rule, reflects in its employees the policy, principles, and judgment of its chief, and its general reputation and character is clearly indicated and established without error.

A wonderful work is being performed now in the West by conserving flood waters and letting them go back gradually to the streams after having been used on land for irrigation purposes. This work justifies the hearty cooperation of the whole country.

We are in our infancy in discovering the raw material and energy which will be used by future generations, and it is safe to assume that the brains of mankind will solve every problem as presented if we only conserve our resources in an intelligent and sensible manner according to the knowledge we now possess. Nothing, however, can make amends for lack of energy and foresight in the conservation of our natural resources.

CONSERVATION IN RELATION TO LABOR

SAMUEL GOMPERS

PRESIDENT AMERICAN FEDERATION OF LABOR

Although we are fairly familiar with object lessons touching the tremendous strides of production in industry, art, science, and invention, we are not fully aware of the constant tendency of these pursuits to reduce the volume of the earth so that, in a figurative sense, its lines and dimensions are narrowed and the various nations and peoples brought into closer and more compact association.

Time is the prime factor in the distribution of the world's products. Speed in delivery of products is secondary only to the resource for their production. The reduction of time then in transportation of products and raw materials in commerce is one of the most important links in the chain that binds nations closer together. Speed in the transmission of communications, news, and the like, is another link in this mighty chain of the conservation of energy applied to industrial, commercial, and maritime pursuits. The enormous investment of labor and wealth in maritime commerce is another link in the chain.

The principle of exportation underlies in another form the unity and amalgamation of nations, the true economic idea being that an excess of exports places the balance of trade with the nation or people possessing resources in the greater abundance, together with facilities and skill to produce and market them. All nations are striving to excel in exports, thus making the world at large their market, and, as a corollary, bringing the nations closer together. When we say that the markets of New York and Liverpool or London are within five days of one another we are stating a twentieth century economic principle as against one of the sixteenth, seventeenth or eighteenth centuries, when those markets were from six weeks to two months apart.

The language of production and transportation is cost and speed time. A shipment of goods from New York to Denver or San Francisco is figured at so many days. Chicago, New York, Boston, Liverpool, London, Paris are so many days apart. Distance is no longer the computation. In the reduction of time distance is annihilated. The merchant prince sitting in his office in Chicago is in practically immediate connection with his business and financial correspondents on the two seaboards; or, if it is required, he can cable his orders to London, Singapore, Shanghai, Yokohama, or any other of the myriad centers of industry and commerce on the globe.

The People, the American People, are to become aware of this foreshortening of the industrial and commercial perspective, and there must be wise measures introduced for the conservation of economic energies. The abolition of Time's tyrannies must not be considered at all complete in the strides already made. It must be carried forward into those natural reservations the nation must use in building and providing for posterity. Added to this requirement is the constant vigilance necessary for the welfare of the workers, the wealth-producing wage earners, for in the last analysis upon their material advancement depends the future of our Republic. The farther the American People go in these provisions for the future, the more worthily they will subserve the true economic principle—that is to say, the conservation of natural resources and energy of the laborer in production for the welfare and well-being of the Nation.

Prominent and vital among these measures of the national defense against the encroachments of the world's commercial contraction are the effects of flagrant waste that lie in the unemployment of wealth producers, in the denudation of forests, unchecked rapacity of corporate monopoly in lands, mines, waterways, and other natural resources of wealth subject to exploitation. The Nation will have to meet the issue of intrenched "vested rights" when it comes fully to deal with the principles of reclamation, and these criminal wastes will have to be checked.

For the present, however, the reclamation of public lands in arid regions, reforestation, development of waterways, the preservation of mineral beds and the extension of natural reservations, form the groundwork of one of the most important of all the constructive features of the national life. It is a matter of profound interest and gratification to the

American People that the Conference of Governors of States, forestry, irrigation, and waterway engineering experts, and others who have given the public weal their study, was called together by the Chief Executive of the Nation.

These eminent citizens are gathered in obedience to a call, the inspiration of which strikes the key-note of the Nation's future policy in the field of civic betterment. It is the extension of the new school of political economy. It is in the nature of the great stewardship that underlies the brotherhood of man. No more noble incentive to that end can be imagined than is to be found in the impulse that prompts wise and far-seeing statesmanship to build and preserve for the future. Happily, too, this Conference will act as a check on the marauding instinct so flagrantly exercised in the exploitation of the Nation's natural resources by men whose actions have hitherto been sanctioned by law. In respect of waste and extravagance in the economic sense, these marauders have placed the American Republic in a situation unparalleled in economic conservation among the nations. In one item alone, that of fuel, it is figured out by one of the experts attendant upon this Conference that two hundred million tons of coal are wasted every year in the mining processes of the nation, which is equal to two hundred million dollars, every ton of coal being worth a dollar at the mines. Add to this the colossal waste in the exploitation of timber lands, waterpower, and the like, and we have some faint conception of the load our economic energies are carrying.

It is a matter of fruitful reflection and congratulation that a halt is to be made in this mad scrimmage after the cream of our industrial resources. Not only is the public domain thus ruthlessly exploited, but what is of far more importance, the lives and fortunes of myriads of the working units of the nation are exploited with as little concern (and in many instances with less concern) as that which pertains to the exploitation and pillage of the Nation's physical resources.

It is now more than thirty years ago when, with a number of workmen in New York City, we established a Labor Lyceum in connection with the labor organizations of the times, and at its weekly meetings this very subject of the conservation of the natural resources of our country formed the topic of lectures and discussions covering a period of many months. The discussion formulated itself in declarations of the organized labor movement of our country, which declared the very principles enunciated at this Conference. Of course, I should add that the question of the denuding of our forests was not then an imminent danger, and, therefore, formed no part of the discussion. I mention this, however, to emphasize the fact that generally speaking the declarations and demands made by the organized labor movement of our country are a decade or more in advance of their general acceptance, and this is what this present Convention of experts means, and these are some of the legitimate ramifications that attend its deliberations; it means the readjustment of resources to economic conditions.

Perhaps the greatest form of waste from which we suffer at this time is the waste involved in the unemployment of immense numbers of our people, and this waste is due to no fault of the working people. Without affirming to whom is traceable the blame of the present condition of unemployment, no one can truthfully charge that the cause can be laid at the door of the working people of our country. It is perhaps the severest commentary upon the intelligence and understanding of economic and social conditions that there are at this time about two millions of our working people vainly seeking the opportunity of working and earning their bread by the sweat of their brows. Apart from the demoralizing influence of such a state of affairs, a mere statement of the material loss may not be uninteresting.

It is now seven months since last October when the panic was thrust upon our people. Counting 25 normal working days for each month, we have a total of 175 working days, and giving the conservative sum of $2.50 wealth produced daily for each worker, there has been a waste or loss of $875,000,000 of wealth which could and would have been produced but for uneconomic methods.

In our uneconomic methods, no accounting is here given of the myriads of workers whose bodies are maimed or whose lives are destroyed in industry and commerce by ignorance, incompetence, or greed. What is more wasteful, what is more the antithesis to the conservation of our natural resources?

Grand indeed is the vista that looms up in the development of ideas and measures here considered. It will require a generation to work out measures here adopted. We are going beneath the harrow that has thus far scratched over our vast domain. Here we have a continent comprising nearly a score of millions of square miles of territory. The question Destiny is asking us is: "What are you going to do with it? How are you going to hand it down to your children and your children's children? Shall that deliverance be in the spirit of reversion to degenerate types now fostered and proclaimed in a vulgar millionairism with alliances amongst the moral and intellectual perverts of foreign aristocracy, or shall it be in the spirit of that rugged, forceful, and intelligent manhood and womanhood that breeds and fosters the aristocracy of heart and mind as seen in the outworkings of American idealism as well as economic energy?"

We assume, and of just right proclaim, that the physical constitution of the American Republic and its political institutions are rapidly forming the foundation of the world's social, moral, and spiritual regeneration; and on such assumption and proclamation this Conference must stand. There is no greater or more profitable business enterprise now before the Nation than is included in the plans and purposes involved in the discussion of the subjects here considered.

We are standing at the meeting and parting of ways. We are preparing to take hold upon a new form of national life. We are to leave the old ways, taking with us a glorious and profitable experience. We are to set our faces toward the oncoming prodigious development of our country. Population is increasing enormously. Commercial centers are taxing their energies to provide for the handling of our manufactured and raw materials, of our crops, and the housing, feeding, schooling, and general livelihood of their constantly growing populations. Millions of acres of virgin soil are being prepared by irrigation for the farmer and the husbandman. The great watersheds of the country are more and more forcing themselves upon the attention of wise and thoughtful conservators of the Nation's future; inland waterways; great canals and navigable streams whereon to float the commerce of the future; the development of forestry as an art, and the seeding, planting, and cultivation of young trees; the appointment and maintenance of national commissions to look after these great projects; the prospective establishment of a Department of Labor with a secretary in the President's cabinet—all these things loom up on the horizon of this new day or era in the progress and development of the American Republic.

When we see the great cities of our country and their environs stretching away through their once suburban population, and all the intervening territory a bounteous and marvelous reservoir capable of not only housing, feeding, clothing, and educating the People of our mighty Republic, but which will become a gigantic mill to grind our products and commodities for which the whole world will bid, we shall attract to our shores the vine and the flower of the world's civilization.

We shall in truth become the asylum of the oppressed; and as we now stand for political and religious liberty, so shall we become the exemplar and defender of industrial freedom.

When we have all of these advantages, the labor energy of the Republic will dominate the world.

For it must be borne in mind that labor energy is the foundation of all wealth. Nothing is accomplished without labor.

Nothing is ever produced without labor.

You can transport a train load of gold dollars from New York to San Francisco and back again and keep on doing so, but these gold dollars will never produce a single atom of new wealth.

Labor alone is the womb in which are nurtured and fostered every blessing that attends the progress and development of mankind.

When we are expanded and developed, our national resources wrested from the hands of heedless marauders and conserved as the nation's patrimony; when our great natural waterways are connected with canals; when our denuded watersheds are rehabilitated and made verdant and fruitful, and when the Nation through the people speaks, the working men and the working women, who in reality do everythng that is done, will take their place in freedom.

The Nation can not shirk its responsibility; there are many evils to be overcome; still the preponderance of energy is on the side of progressive development, with justice and amity as the controlling spirit. It is an evidence of enlightenment that the Nation turns its face against iniquity; the masses of the people and the majority of leaders, thinkers, and exemplars amongst them have no alliance with these detriments to society and the State. Prisons yawn all the while for small thieves and depredators. What is essential is to pitch some of the great thieves and colossal hypocrites into them. But these matters are incidental, however their front frowns upon the public attention. The stress of the storm and tempest of the Nation's activities is toward the upbuilding and sustaining of principles of justice and equity to all men. We shall carry these principles into our industrial, business, and commercial life as we proceed in our activities, and we shall be instinct with that spirit of mercy and generosity which forms the athletics of the mind.

We shall invite the world to us, and the world will come.

Let us be true conservators of our natural resources.

Let us lay violent hands upon the predatory spirit that skims the cream and runs away with it, leaving the refuse for the babes, mothers, and fathers who are poor.

Let us make it impossible, by removing the germs that produce the disease, for any man in this Nation to control for his private benefit any portion of that natural increment which wealth attaches to itself and which belongs to the whole people, the workers, whether they be high or low in the scale of production.

When there shall come to our people a better understanding of the husbanding of our natural resources, the readjustment of economic conditions will not leave out of the equation the men and women of labor who are so essential to our industrial, commercial, political, and social welfare—the men and women who perform so great a service to society.

VIEW OF THE ENGINEER

HENRY G. STOTT

PRESIDENT AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The very able papers presented before this Conference may be briefly summarized and conclusions deduced from them as follows:

Under present wasteful conditions:

(1) Forests will be practically depleted at the end of twenty-five years.

(2) The best grades of iron ore will be exhausted in seventy-five years.

(3) The ever increasing demand for coal for manufacturing, heating, and transportation purposes is such that one hundred years hence the available supply will be so difficult of access and so inferior in quality that the relative cost per ton will be several times its present value.

(4) The soil is being so exhausted by the short-sighted methods of unscientific farming that instead of the yield per acre being increased it is steadily decreasing and has now reached a point at which the returns are 50% less than they should be.

The remedial measures to be taken may also be briefly summarized as follows:

(1) The adoption of a liberal policy of reforestation under the State and Federal Governments will in time effect a complete solution of the problem, and at the same time have a most important and salutary bearing upon the question of water power and irrigation.

The measure, however, to give immediate relief is the removal of the tariff on lumber.

(2) Apparently no remedy for the exhaustion of our iron ore is in sight. The removal of the tariff will unquestionably postpone the evil day of complete exhaustion and tend to equalize conditions all over the world.

(3) Fortunately we have at hand agents by means of which the coal supply can be conserved for several hundred years. It is estimated that the actual horsepower used for all purposes in the United States does not equal more than 10,000,000 during maximum demand, and it is also estimated that the undeveloped water powers would give approximately 30,000,000 horsepower.

To make this enormous supply available where wanted, electric transmission of power can be successfully and commercially used at present up to a distance of over 200 miles; and there is every prospect that this distance will in the near future be greatly increased.

Each horsepower developed by heat derived from coal now requires approximately eight tons of coal per annum, so that if the 10,000,000 horsepower now used could be developed by water power there would result a saving of not less than 80,000,000 tons per annum.

A saving of fuel of great importance will undoubtedly result from the research work now being carried out under the Technologic Branch of the United States Geological Survey, as no question in engineering has been so neglected as the efficient combustion of fuel under boilers. Since the results of the numerous tests carried out by this Technologic Branch have been published, great interest has been stimulated in the subject and more scientific results obtained by the large coal users.

(4) The States, through their Agricultural Departments, have control of the question of scientific farming in their own hands, and although much excellent work is being done in our Agricultural Colleges and Experimental Farms, this work must be extended so as to reach all concerned.

Perhaps no other body of men come quite so closely in contact with the problems involved in this historic Conference on the Conservation of our Natural Resources as Engineers; and speaking for them, I can promise their hearty and disinterested cooperation in this great patriotic movement inaugurated by you.

CONSERVATION OF MINERALS

John Hays Hammond

PRESIDENT AMERICAN INSTITUTE OF MINING ENGINEERS

What has been said of the danger of the rapid depletion of the iron and coal deposits is applicable, mutatis mutandis, to the other mineral deposits of the country.

In common with every other national industry, that of mining is vitally concerned in the conservation of our natural resources. These discussions show conclusively the interdependence of our national industries. The exploitation of our mines depends, chiefly, upon the costs of labor, power, and supplies; and these costs are determined by the economies attending the development of our other natural resources. Thus the cost of mining labor is dependent upon the expenses of living; the cost of power, upon the cost of fuel or the cost of power hydro-electrically generated; and lastly, the cost of supplies depends upon the cost of their production. Therefore, upon the economies effected in the other national industries depends, reciprocally, the cost of our mineral products. Now obviously, the lower the cost of mining, the greater the available tonnage of products that can be profitably mined. Indeed, in many of our low-grade mines, so called, the margin between profit and loss is so small that any appreciable increase in the cost of mining involves pecuniary loss and the consequent cessation of operations. Furthermore—and this is important—the mines of this character are those from which the major part of our production is derived.

It has been, unfortunately, the popular custom to refer to large deposits of ore as illimitable and inexhaustible. Such hyperbole characterizes the description of the famous gold deposits of the Transvaal. As a matter of fact, we mining engineers know that even these exceptionally extensive deposits will be practically exhausted within a couple of decades—certainly within a generation. The ever increasing rapidity of exploitation consequent upon the exigencies of modern engineering and economic practice, inevitably tends to an alarming diminution of the lives—if I may use that term—of our mineral deposits. The culmination of our mining industry is to be reckoned in decades, and its declension (if not practically its economic exhaustion) in generations, not in centuries. While it is undoubtedly the fact that a very considerable lowering of the working costs or a correspondingly greatly enhanced value of the mineral products would prolong the activity of the mining industry, yet the statement I have made, predicated as it is upon the known mineral deposits, may be regarded as conservative. Explorations will undoubtedly lead to the finding of new mining fields, but the discovery of the more important deposits will, in all probability, occur in the comparatively near future.

There is no way of revolutionizing our mining methods to attain better results, but they are susceptible, it is true, of great improvement, and especially so in the metallurgical processes. But even therein the irreducible minimum is not great, compared with the advantage that would result to the mining industry from the conservation of the natural resources of the country.

In striving, as we engineers are doing, to prevent, as it were, the leakage of water through the bung-hole, we see a large volume flowing out through the broken staves at the other end of the barrel. It is for this reason that you may rely upon the hearty cooperation of the miners of our country in your efforts to conserve the Nation's natural resources and to perpetuate our national supremacy.

RAILWAYS AND CONSERVATION

WILLIAM McINTOSH

PRESIDENT AMERICAN RAILWAY MASTER MECHANICS ASSOCIATION

At the close of the year 1906 there were 2,160,542 freight and miscellaneous cars in service on the railroads of the United States. Of this number approximately 350,000 are all steel, and 250,000 have steel underframe only, leaving 1,560,542 wooden cars of varying age to be replaced, it is safe to assume, within the next 15 years, as they are not likely to average longer in service. That the new cars to replace this equipment, with but very few exceptions, will be largely of metal is a foregone conclusion.

For the bodies of box cars no satisfactory substitute for wood has yet been accepted, though we can look with considerable confidence to the chemist and metallurgist to furnish some combination of metal and asbestos, or other fibrous material aside from wood, to meet the purpose. Many experiments are now being made along these lines. We must also look to the chemist and metallurgist to improve the quality of metal for car construction, which thus far has not been entirely satisfactory. Compounds and alloys will no doubt be forthcoming to raise the standard to meet requirements of maximum strength and minimum weight, that will permit the construction of cars and locomotives of the greatest possible strength and least proportion of dead weight for the limited space available for their operation.

Assuming that in the future but little wood will be used in the construction of cars and locomotives, the railroads will still be greatly interested in the question of timber supply, for much lumber will still be needed to meet their varying requirements, and as produce carriers they would be vitally interested in the protection of forests and water conservation.

Dr W. F. M. Goss, in a recent address before the American Society of Mechanical Engineers, in New York, stated that at present there are 51,000 locomotives in service, burning nearly 100,000,000 tons of coal per year. This is an enormous amount, and the opportunities for radical changes in locomotive construction are few, owing to the limitations in dimensions and weight, and it seems that efforts to develop more economical machines must necessarily be confined toward securing the most perfect construction and maintenance of existing designs, with the possibility of accomplishing something in the direction of feed water heating, compounding and superheating, although the additional expense thus far encountered in the mechanism of these devices has largely offset, along practical lines, the economies sought. Strenuous conditions of railroading for several years past have confined the efforts of all departments, and particularly the mechanical, to maintaining equipment in condition to meet current requirements, leaving no time for what may be classed as "refinements," under which head might be considered feed-water heating, compounding and superheating, and it is doubtful if much can be done in this direction under the more moderate conditions now prevailing, for as revenue decreases from various causes the necessity of reducing expenses to conform predominates, and funds are not available for betterments along unproven lines.

Stationary and marine practice afford better opportunities in this respect, though also circumscribed. The reciprocating and turbine engines seem to have about reached their maximum efficiency, and about the only field remaining open for important development is in the line of gas producing and internal combustion. As there still remains a large proportion of the thermal content of coal unaccounted for, fortune and fame await the engineer who succeeds in corralling these straggling units.

The President's efforts to awaken the People to the importance of protecting growing timber, and encouraging the planting of young forests, should and will command the hearty support of all thoughtfnl persons and lead to earnest cooperation in this direction. There are usually parts of any tract of land that are not suitable for general cultivation, but would successfully nourish trees if properly worked, and with but little effort and expense the ordinary farmer, equipped with the usual farming implements, could plant these places with trees of varieties that would soon develop and prove valuable for various purposes, and hardly realize the exertion. I speak from experience in this connection, as I have had planted with trees, in then barren districts of the Middle West, two residence properties and one Government timber claim, and enjoyed the satisfaction of seeing them reach proportions of gratifying dimensions and considerable value in a period of 10 years; and it only requires the general interest that is now being awakened along these lines to reclaim, beautify, and bring to a producing stage many a tract now unsightly and unproductive.

THE PRESERVATION OF SCENIC BEAUTY

GEORGE F. KUNZ, PH. D.

PRESIDENT OF THE AMERICAN SCENIC AND HISTORIC PRESERVATION SOCIETY

In behalf of the American Scenic and Historic Preservation Society, and of the widespread public sentiment which it represents, I desire to express the most hearty appreciation of the broad national spirit manifested by the President of the United States in calling together this notable Conference on the Conservation of Natural Resources, and in including within the scope of its consideration the subject of the preservation of the natural scenery and the historic memorials of our great country.

The intimate and physical connection of these subjects is almost self-evident. The great forces of nature which have created the mineral wealth stored beneath the surface of the earth, which have carved the hollows and valleys in which our lakes lie and our streams flow, which have lifted up our mountain ranges and which have made the soil that feeds our forests and crops, are the same forces that have made the diversity of topography called scenery, which delights the eye, stirs the imagination, and reveals to the wondering mind the operation of the beneficent Power which provides all. And topography, in its turn, has from the advent of man profoundly affected his movements, his life, and his development; and thus, for many reasons which there is no time here to elaborate, human history has ever been identified with conspicuous features of the natural landscape.

In advocating in this Conference the protection of American scenery, I would deprecate the notion that there is an irreconcilable antagonism between the idea of scenic preservation and the idea of properly utilizing the material resources, or that there is some irrepressible conflict between so-called sentimentalism on the one hand and utilitarianism on the other. Every interest represented in this Conference is looking forward to the same object—the greatest happiness and good of the greatest number—and that object is going to be attained best by friendly cooperation, by mutual adjustments, and by reasonable concessions when necessary.

The purpose of the Scenic Society, as our organization is called for brevity, is to encourage the regard for the beautiful without the slightest desire to check the development of forests, mines or railroads or the rational utilization of water for power, irrigation, or municipal use. But it must not be forgotten that there are many factors of human happiness. In the lowest status of savagery, in which man is nearest to the beasts of the field, his happiness depends almost exclusively upon the ministration to his bodily wants. But as he lifts himself up through the middle and upper stages of savagery, and through the three stages of barbarism into the various degrees of civilization, a new element of happiness enters in increasing proportion into his existence. In this rise, with its accompanying intellectual development, man's thoughts constantly range farther and farther from the narrow limits of his own body for satisfaction, and, while the meeting of his physical wants is the first and cardinal necessity, after that end has been attained he is not satisfied until other appetites of his being have been fed.

The wholesome pleasure which one derives from the contemplation of the beautiful and wonderful in nature is one of the accompaniments of our civilization. We can not get rid of it if we would; and we would not if we could. It makes us better citizens, happier citizens, more efficient citizens. It is a fact of human nature to be honestly recognized and properly ministered to, and not to be put aside as empty sentimentalism any more than the utilization of the physical resources of the land is to be set down in contempt as commercial utilitarianism.

Our object should therefore be to see how closely we can get together so as to merge our interests for the common good; and it is at this point we find the necessity of some judicial power higher than the individual to weigh the merits of conflicting interests involved in a given proposition. There are occasions, for instance, when the net value to the community at large of damming a given stream at a given place may not be truthfully expressed in the dollars and cents gained by the enterprise. It may be found, when all considerations are balanced, that the location of the enterprise farther up stream or farther down stream, or on some other stream, or its prevention altogether, may conduce to the greatest good of the greatest number. Hence the necessity for regulation by some branch of Government representing all interests, and it is proper that the spirit of order should be invoked to regulate the destruction or disfigurement of trees, rocks, river banks, and other notable features of the landscape.

We have seen that there is no more valuable agency than that of the scenic beauty of the forests, of the mountains, and of the rivers and their banks toward the creation of an esthetic taste and a love of the beautiful in the average mind. For this reason such objects of natural beauty should be carefully guarded from injury or destruction. Nevertheless all along the line of the Hudson River valley, one of the most beautiful in the world, with its majestic, deep and silent river, almost the entire right bank has been shorn away by the building of a great railroad. Much of the injury done may be attributed to a lack of knowledge as to the value of landscape beauty at the time the franchise was given; but when we see that the beautiful bay near Croton Point is now being filled in by a six-track road, and that a power-house lies within the shadow of the famous Van Cortlandt manor, we pause to wonder whether, if this railroad had been built one or two miles farther in the interior from the bank, it would not have been a greater public benefit than it is now, and whether, at the same time, a better service would not be given to the people who are now compelled to haul everything uphill for a considerable distance.

In Europe one sees everywhere grass or fields up to the very edge of the railroad. There is an absolute lack of the ash-heaps, the piles of timber, and the general appearance of devastation that disfigure the lines of most of our American railroads, as well as the stations. In this connection the enactment of some regulation to check the pest of tacking, nailing, or otherwise securing to the shade trees along the roads, advertising signs made of wood, tin, cloth, paper, etc., is a matter that should be seriously taken up by some one. An effort should also be made to improve the looks of large manufacturing plants and yards by inducing their owners properly to heap up or house the tin cans, garbage, and ash-heaps that are frequently a menace to the public health and are gathering places for rats, mice, and vermin of all kinds. In the vicinity of quarries and mines also, a certain amount of care should be used in the dumping of materials, so as to preserve as much as possible the natural beauty of the country.

The face of the Palisades, the cliffs known as the steep rocks, form one of the grandest objects of scenic beauty near any great city. They would not be of much value for any commercial purpose, but as an asset in increasing the worth of property on the New York side of the Hudson river they are of incalculable value. These thirteen miles, if despoiled, would have lowered the worth of the property of the New York side at least $10,000,000. On the other hand, with a proper system of forestry this land should bring in enough revenue to defray all the expense for its care. These Palisades were saved from destruction by the State of New York, through the initial step taken by one of our foremost citizens, Mr J. Pierpont Morgan, who has always been ready to save an object of beauty, whether the product of nature or art a painting, a mineral collection, or anything of public interest.

Stony Point Park was dedicated three years ago, and to the surprise of our then Governor, Mr Odell, twenty thousand people gathered on a single day to witness the dedication of a park that had cost only thirty thousand dollars. This reservation serves not only as a historic reminder of the King's Ferry and of General Wayne's victory, but it is also for us a beauty spot which is visited annually by thousands, one of the few parks we have within a radius of quite a number of miles.

We have now to deal with the problem of a Hudson Highlands Park, embracing the highlands of the Hudson, that beautiful group of mountains through the center of which flows the queen of the northern waters. Many thousands of acres of this wonderful woodland can be bought for less than the cost of stumpage. Were this land condemned and systematically purchased, it could be obtained at from ten to twenty dollars per acre. If great tracts were acquired and placed under Federal supervision, such a reservation ought to form a valuable asset as timber land and possibly would prove a welcome source of supply in times of timber need in the very near future. In addition to this, the increase of the value of property far and near would be an inevitable result.

We must also remember that the establishment of State or National parks and reservations tends to give a much-needed shelter to "the denizens of flood and field." Reliable historians tell us that buffaloes roamed in Virginia one hundred years ago. Fifty years ago there were so many wild pigeons in the woods on my farm that two dozen could easily have been killed in an hour's shooting. And yet in the fifteen years of my residence there not a single wild pigeon have I ever seen. About the same time the New York Historical Society celebrated its fiftieth anniversary. They had a day's festivities at the Astor House, and their bill of fare still exists. This was before the days of cold storage, and game and fish were not shipped great distances; nevertheless, the dinner given in honor of this anniversary contains as many as twenty kinds of game to select from, and fifteen or twenty kinds of fish. These were all obtained within a few hours of New York City. What has become of them?

To preserve what is left us of the life that helped to give color and movement to the landscape there must be Government supervision, for there are those who would kill the peacock on your lawn; who would kill the only heron on your brook; who would kill every squirrel or bird that flies, leaving a lonely waste where formerly there was cheerful, beautiful life. It is this desire to kill, this spirit of wanton destruction, that must be suppressed as there are laws to prevent the killing of man. Such is the spirit of prodigal waste in regard to our natural resources that it has in some cases almost entirely obliterated them. A similar ruthless disregard of beauty in the pursuit of mere temporary advantage has turned the Hudson river into a sewer and a cess-pool. On an unusually hot day, a few years ago, I noted thousands of eels dead in the water all the way from Peekskill to New York, showing how putrid the water was a few feet from the shore.

A convincing example of the practical utility of efforts to do away with what is ugly and to substitute therefor beauty and order, is afforded by the wonderful transformation of Paris under the Second Empire. Napoleon III, after consulting with Baron Hausmann, his architect, arranged that one of the most unattractive districts of Paris should be condemned by the Government and replaced by the magnificent Avenue de l'Opera, with its Grand Opera House for a starting point and the Louvre for a termination. This added millions of dollars to the taxable assets of Paris and gave that city the greatest avenue in France, making Paris so beautiful that millions annually are left there by visitors who are attracted from far and near.

Modern Paris offers us another instance. Some thirty years ago, there was in that city a great lime quarry known as the Buttes Chaumont; it was riddled with quarry holes and small caves, and during the Commune it was a very hotbed of the worst type of anarchists and dynamiters, the entire neighborhood around it being of a very low order.

The French Government condemned this quarry and set some landscape artists to work, and the resulting improvement has converted it into one of the most beautiful parks in any great city. The caves have been turned into passages and stairways, the deep quarry holes into lakes, and a spirit of beautiful natural order prevails that makes a visit to it a great pleasure. Incidentally, the entire value of the adjoining property for quite a distance has been greatly advanced, resulting in a higher valuation and a corresponding increase in the tax received by the municipality of Paris. In addition to a very real and substantial gain, such improvements not only stimulate the esthetic sense in a citizen but also inspire him with an ardent love of his home. Not only in Paris but in rural France also we can note the advantages of striving rather to enhance than to diminish natural beauties, for it is well known that, no matter how poor a Frenchman's village may be, it is so beautiful that few Frenchmen ever leave home. It seems almost unnecessary to allude to the care taken of every beautiful site in England, Italy, Germany, Holland, and Switzerland, and these countries receive a full pecuniary reward for the attention bestowed upon such matters, although this may not be the sole and only object in view.

But it is not necessary for us to go abroad for examples, if such be required. During three months in 1907, the New York Central Railroad derived nearly $200,000 in fares on account of its Niagara business alone. Since the establishment of the New York State Reservation at Niagara in 1885, 15,000,000 persons from all parts of the world have visited that great spectacle. The establishment of the free reservation has saved these visitors, at a moderate estimate, an average of one dollar per capita which they used to pay when the Falls were shut in by board fences and fees were charged for admission to the various view-points. And who can compute the amount of money brought into the State and left here in the hotels and stores by tourists drawn from the four quarters of the earth?

In the Adirondack Park there is between $10,000,000 and $15,000,000 invested in hotels, boarding-houses, private camps and cottages, which have nothing to do with the utilitarian aspects of the forests. Employment is given to about 15,000 clerks and helpers of all kinds who received during the short summer season about $1,000,000 in wages. Hotel guests spend between $5,000,000 and $6,000,000 a season there, and the passenger traffic alone on the railroads amounts to over $1,000,000. A large proportion of this income is derived from visitors from other States and countries.

It is evident from these few figures close at home that a compilation of statistics which would include the Yellowstone, the Grand Canyon, the Petrified Forests, the Yosemite, and the other scenic attractions of the

United States, large and small, far and near, would reveal, in terms which could not be misunderstood, the powerful and pervading desire of people to see and commune with the beauties of nature, their willingness to pay for the privilege, either directly out of their individual pockets or indirectly by taxation, and the pecuniary advantage to the locality which fosters this sentiment. The same rule applies all the way down from the cardinal features of our national domain to the city park, the village green or the individual door-yard. That town or home is most valuable which looks neatest and best, which is most attractive to the dweller, which quiets his nerves and his body by making most pleasing impressions on his senses.

Scenic beauty, therefore, is a real value, and while its preservation should not be worshipped as a fetish and no fanaticism should carry its advocates to the extreme of opposing crying public needs for physical development, commercial enterprise on the other hand should take respectful cognizance of it as an actual and substantial fact and should not wantonly destroy the public's scenic right.

Scenic objects are frequently preserved because of their historic value. If they have this historic value and are also beautiful, they should be most carefully guarded, as have been Gettysburg, the park at Lookout Mountain, and Arlington Cemetery, the resting place of our great and illustrious dead. These are not only historical; they are also beautiful. They give a home feeling to the citizen that serves to make him a better American, and in time of war will add to his stability and enable him to march the Nation's flag on to victory.

Give us enough beautiful parks, such as the great reservation at Niagara, the Yellowstone Park, the Yosemite Valley, the Agatized Forest, the great trees of California, Letchworth Park Gorge, Watkins Glen, the park around Bunker Hill Monument, and numbers of others. Give us good roads to connect these; establish proper food supplies in the form of comfortable hotels, and millions of dollars will remain here to increase the amount of the Nation's assets and to be a continued and recurrent source of income to the many.

Many thousands visit Alaska. Do they make this journey to see the mines, or to see the wondrous beauties of the semi-Arctic dependency of our Government? Give a free hand to a certain number of mine owners or prospectors or hunters, who have no thought for anything but the present, and even a vast region like Alaska can be devastated by the recklessness of those who will wantonly fell trees, or carelessly expose them to become fired, thus allowing waste and destruction to follow in their path. Who has not seen thousands of acres of land simply stripped of its best timber? Everything is littered with the wreckage of the devastators; whereas, if some judgment had been used in cutting even as much as nine-tenths of the timber and guarding the remainder for five or ten years, an income might have been derived from what ultimately becomes nothing but a jungle, unless by chance a city site is located on the land.

There are many who will never have a sentimental thrill and who would remove or destroy Niagara if they could thereby clear a profit of only 5%. While at Mammoth Cave in 1898 with a Brooklyn party, one of the largest contractors said to St. Clair McKelway, whom he knew: "McKelway, if you ever own the county, give me the contract to fill the cave." This was said in good faith by the worthy son of Erin, and there are, no doubt, many others who would take such a contract and begin work on it in a day's time.

We have all heard of the fame that came to Bierstadt for his painting of the Yosemite; to Church for his painting of Niagara Falls; but we, fortunately, still have the originals, and artistic though the paintings be, they could no more replace those originals than could Houdon's statue of Washington replace or bring back to us the immortal George Washington, or Saint Gaudens' Lincoln or Sherman take the places of the great President and general themselves. The resources of a mighty Nation would be vainly expended for a thousand years in the attempt to replace Niagara Falls or the Yosemite Valley. Let us, therefore, cherish and preserve these grand works of Nature.

The intrinsic value of natural beauty may be illustrated by a comparison with the worth of some monuments of art, since art is closely related to nature, being, in fact, the outcome and outward expression of the impressions of natural beauty stored up for generations in the mind of man. Remove the Parthenon from Athens, in other words, sell it for what it is worth in marble; how much would the land under it bring? As it is today, a magnificent ruin, it is a jewel in the diadem of Greece, the central point in her coronet; a spot for which every nation in the world has the greatest admiration.

It is true that in Rome some rows of buildings were erected from materials taken in the despoliation of the Coliseum, and it is also true that from what is left of that structure more buildings could be erected, while the land could be utilized for building purposes. But what would Rome be without her Coliseum? Not only is it a magnificent ruin, but it embodies the very life of the ancient Romans; it is the apotheosis of the might and greatness of a nation which once held virtually all of the civilized world. We may also cite a much more modest example, the Albrecht Durer house in Nuremberg. This probably does not represent a value of $20,000, commercially, but what an asset in the resources of that quaint old city, and what a tribute it is to the artist whose work will be immortal!

Oscar Wilde showed his ignorance when he said to an American lady, in criticism of this country: "You have no ruins." The lady's clever

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reply, "We import them," was unnecessary, as we have ruins as historic and as grand as many in England. Take, for instance, Casa Grande, the hundreds of cliff dwellings, Jamestown Island, and the buildings at Williamsburg, Virginia, and St. Augustine. Then we have the many buildings in Salem, Boston, and other New England and Eastern cities; as, for example, the house of Paul Revere, and the Hawthorne house in Salem; besides these, we have the Verplanck house in which the Society of the Cincinnati had its birth, the old missions in California, and dozens of others. All these mementoes of our past need care; we have ruins, but we must save and conserve them. Then our country can point with pride to its antiquities, many of which are as old, while some even antedate the historic monuments of England.

Let us look to Japan, our new world power, and see how, for centuries, the Japanese have taken their rocky crags and untillable soil and have turned them into sheep pastures. How they encourage native endeavor! They never disturb even a bit of moss. Their rock gardens, natural and artificial, at times created at great expense, are the most charming and restful in the world. There are ten thousand acres of such land within a radius of fifty miles of New York, neglected and never noticed, that would be of great value if once its possibilities were understood and appreciated.

We have wasted our forests and the stores of our mines, our water powers and waterways; we have been extravagant to an extreme. Hotels can not be found luxurious enough; books that our fathers carried in their pockets have been issued in editions de luxe and sell for $1,000 a copy, requiring several cubic feet of shelf room for a resting place. This waste has called a halt in commerce. Our railroads are clogged, not taxed to their utmost; our presses are worn out printing share certificates, and a spirit of lawlessness, almost parallel to that of imperial Rome before its downfall, is apparent in many places. But we can safely trust to the essential soundness of our civilization and to the sterling common sense of our people. Whatever may happen to the superstructure, the foundation walls of our society and of our Government are too well laid to be overthrown.

There are a hundred scenic sites in our great public domain of 145,000,000 acres that it would not cost us a penny to set aside, and if they are once reserved for scenic and forestry use, the value of the adjoining land will be greatly enhanced. We must proceed at once to preserve for our own use, for our children's use, and for posterity, those gifts of nature that will make our country a beautiful as well as a great one, if we can conserve our Nation's scenic resources.

The State of New York has appropriated $162,000 to be used by the Hudson-Fulton Commission to celebrate the three hundredth anniversary of the discovery of Hudson river and the one hundredth anniversary of the introduction of navigation by steam, the inventor of which was Robert Fulton. Several societies and other interests in New York propose to dedicate some scenic and historic site on that date. The discovery of Hudson river had a permanent influence on the progress of the Nation, as the Hudson valley, with the Erie canal, gave an outlet to the Great Lakes; but steam navigation, of even greater significance than this, gave to the whole world a mode of water locomotion of a swiftness and independence undreamed of before, for who had ever conceived the idea of a boat whose speed was not governed by the winds?

Therefore, if every Governor of these United States could mark the hundredth anniversary of steam navigation by setting aside some site of scenic beauty, especially one of historic value also, our Nation will have made a distinct advance.

While the operations of the American Scenic and Historic Preservation Society are national in their scope, it may be of interest to mention briefly what New York has done, either through Government or individual generosity, to preserve the scenery and the historic landmarks of the Empire State.

The movement in that State appears to have begun in 1849 with the purchase of Washington's Headquarters in Newburgh, overlooking the Hudson. The property includes the house and six acres of land, and from 1849 to 1907, inclusive, the State has spent $120,659 in acquisition and maintenance.

In 1883 and 1885 the State acquired 412 acres of land and land under water at Niagara Falls, and, deducting the income from certain concessions, has spent upon the property the net sum of $2,166,605 up to this year.

In 1887 it acquired the venerable Senate House at Kingston, on Hudson river. This has cost the State thus far $38,040.

In 1895 the State acquired by gift the old John Brown farm in the Adirondacks, comprising 243 acres of picturesque and historic property, where now "John Brown's body lies a-mouldering in the grave."

In 1896 the State assumed the maintenance of the Grant Cottage on Mount MacGregor.

In 1897 it bought 34 acres of the Stony Point Battlefield on Hudson river, made memorable by Mad Anthony Wayne's famous midnight exploit, and placed it under the administration of the Scenic Society. The State has spent $40,500 on the property, and the contributions of our Society and the Daughters of the Revolution to its improvement amount to $8,000 more.

In 1898 and 1900 the State purchased 35 acres of the Lake George Battlefield, and has spent $23,000 upon it, while the Society of Colonial Wars has added a $7,000 monument.

In 1900 the State cooperated with New Jersey in creating the Interstate Palisades Park for preserving the Palisades of the Hudson. The State has spent on this work $410,000, to which the Honorary President of the Scenic Society, Mr J. P. Morgan, added $122,500.

In 1900 the State purchased the old Gov Clinton House in Poughkeepsie, upon which it has spent $6,700.

In 1903 it acquired by gift Spy Island, an historic spot on the edge of Lake Ontario in Oswego county.

In 1904 it bought old Fort Brewerton at the foot of Oneida Lake, for a few hundred dollars, and put it in the custody of the Scenic Society.

In 1906 it acquired Sir Wm. Johnson's old blockhouse, mansion and 18 acres of ground in Johnstown, and has spent $26,500 on the property.

In 1906 it acquired 103 acres at the head of Seneca Lake embracing the famous Watkins Glen, and entrusted it to our administration. For purchase and improvement the State has appropriated about $90,000.

In 1907 Hon. William Pryor Letchworth, of Portage, who has devoted his life to philanthropy, gave to the State through our Society his superb estate of 1,000 acres on the upper Genesee river, embracing the three Portage Falls. This property, upon which he has already spent over $500,000 and contemplates spending more, is entrusted to the care of our Society.

And coming down to the year 1908, Mrs Wm. F. Cochran of Yonkers has given through us to the State the sum of $55,000 for the preservation of the celebrated Phillipse Manor Hall in Yonkers, one of the most ancient and interesting antiquities of the Hudson valley.

If time permitted, I could extend the list by adding the gift of four parks to the city of Utica by Thomas R. Proctor, a trustee of this Society, and of the gift of the Fort Lee site on the Palisades to the Federal Government by Dr James Douglas, another member; but this brief and inadequate recapitulation is enough to show what the State Government and individuals in New York have done to demonstrate their faith in the value of Scenic and Historic Preservation.

Since it has been demonstrated that our national scenery has a value, it follows as a corollary that it should not be mutilated or disfigured, even in case of necessity, without securing proper compensation to the public whose scenic interest is thereby depreciated. The State of New York too long ignored this principle in giving away gratuitously to private corporations the waters of Niagara Falls, worth millions of dollars, materially lessening the picturesqueness of the Falls and their environment. The stand taken by President Roosevelt with reference to the waters of navigable streams of the country, and by Governor Hughes with reference to the water powers of the State of New York—

that the use of the waters shall not be granted to private corporations without compensation—is founded upon equity and justice.

Niagara Falls, Letchworth Park, the Hudson river, the Yellowstone Park, the Grand Canyon of the Colorado, the Agatized Trees, the Giant Redwoods, the Columbia river, and the prehistoric remains of the Southwest, are the poetry of our possessions. And what nation is rich without a poet, and what country has such grand natural objects to inspire the poet as ours?

We have other objects that can be conserved; but we must also guard those already mentioned, lest the water companies and lumber companies and other enterprising promoters, looking to an immediate return, kill the goose that would otherwise lay perpetual golden eggs for the country.

I can not close this statement without adding an expression of the great pleasure which has been given to the country in the service that has been rendered by the course of the President of the United States in taking under the Government's protective care so large an area of our national forests; and also by Congressman Burton and his colleagues in the Senate and House of Representatives who, by the passage of the National Monuments Act, the creation of the International Waterways Commission, and the Niagara legislation, which have empowered the President, the Secretary of the Interior, and the Secretary of War to accomplish so much for the preservation of the antiquities of the Southwest and some of the most notable features of our national landscape.

On the date of the assemblage of this Conference, May 13, we, as an English-speaking people, have been planted on this continent 301 years. As a Nation, we are 131 years old. In this time, we have substantially conquered the natural asperities of this rugged continent. We have attained a large degree of national wealth, a large degree of national comfort, and a large degree of national culture. We have attained a stage of civilization where we need, for the highest development of our people, the conservation of the natural beauties of this—

Land of the Pilgrim's pride,
Land where our fathers died,

of which we sing in one of our national anthems. May we go from this Conference, each to his own home, with a deeper love for our native land and a stronger determination to protect, so far as we may, her "rocks and rills," her "woods and templed hills," her "mountain heights" whence "freedom rings."

METHODS OF CONSERVATION

CALVIN W. RICE

SECRETARY OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The Governor of Indiana has asked a question which I think should be very definitely answered, as it is probable there are other gentlemen who are also impressed with the difficulties expressed by him.

For instance, the Governor asks how one may conserve coal, and if it is proposed to stop the mining of coal. I answer, absolutely no. The American people are especially quick to take advantage of superior methods of operation and it is only necessary to point out to the progressive mine operators that it is possible, by improved methods of mining, to secure a greater percentage of the coal than they are now mining. For instance, the Governor of Kentucky has stated that the average number of deaths from accident in the mines of one of the large operating companies of his State is only one death per million tons of coal as compared with six deaths per million tons of coal on the average in the United States. In order to secure these better conditions throughout the country, therefore, it is only necessary to assist the companies in other States to approach the conditions under which the company in Kentucky is operating. That is the direct benefit of this Conference. This method may be followed in the conservation of all our natural resources.

This whole subject divides itself naturally into five parts: First, inventory of our resources; second, discussion of the problem; third, statement of remedies; fourth, education of the people; fifth, legislation.

The spirit of all investigation, statement, and legislation should be constructive rather than prohibitive. That is, instead of demanding that there shall be no coal mined, show how coal can be mined to better advantage; show how to design plants which shall effectively use low grade fuels, thus making a market for the coal now left in the earth, benefiting alike the operator, the miner, and the user of coal. This is the typical answer for all the problems of this kind.

In order to take up the above five steps, I recommend that each Governor immediately appoint a commission, composed of a representative citizen from each of the great professions, legal, medical, and engineering, for securing information, holding hearings, and promoting discussion, and reporting recommendations to the Governor. The education of the People can take place through such channels available to the Governor as the public press, associations, the Legislature, or otherwise.

The legislation and general benefit to the People will follow as a matter of course after this complete statement before the public.

THE USE OF SOME OF THE NATURAL RESOURCES OF THE COUNTRY AND POSSIBLE ECONOMIES IN THEIR USE

CHARLES B. DUDLEY, PH. D.

CHEMIST PENNSYLVANIA RAILROAD COMPANY AND PRESIDENT AMERICAN SOCIETY FOR TESTING MATERIALS

It has occurred to me that it might be interesting, and possibly throw a valuable side light on some of the questions before this Conference, to ask what becomes of the enormous amounts of coal, lumber, iron ores, etc., about which we have been hearing, and especially whether there is any prospect of these being used more economically in the future. The figures which are given below do not profess to be a comprehensive answer to this question, but they do show where a small fraction of the natural resources of the country go every year. The figures given represent the approximate gross consumption for the year 1906 of the Pennsylvania Railroad System east and west of Pittsburg, embracing nearly 11,000 miles of railroad and a little over 23,000 miles of track. In some of the items the year 1907 showed larger gross consumption than 1906, but in some respects a marked diminution has resulted owing to the depression in business which started in the latter part of 1907. At the present time some 40% of the equipment is idle owing to the same cause, with a consequent diminution of consumption, especially of coal. Strangely enough the cost of stationery in 1907 was nearly double that of 1906. Under the heading of stationery are included blanks, blank books of all descriptions, record books, letter heads, copying books, scratch paper, pens, ink, pencils, rubber bands, etc., etc. The total cost for these items for 1906 was a little over $3,000,000, while for 1907 the corresponding figure was a little short of five and three-quarter million dollars. The cause of this increase in stationery with diminishing business is probably largely due to the new system of accounts introduced during the year by the Interstate Commerce Commission, and requests for statements made by that same body.

Consider next the item of lumber. The largest use of lumber is for cross ties, of which 5,162,416 were used during the year, amounting to approximately 258,000,000 feet board measure. The use of lumber for other purposes is diminishing, especially for car construction. The advent of the steel freight car, which is now being turned out of single works frequently at the rate of 100 a day, is producing a very perceptible diminution in the drain on the lumber supply, while the apparent near approach of the steel passenger coach will soon still further diminish this drain. Notwithstanding these items the use of lumber for other purposes than ties amounted to 145,000,000 feet board measure, or for all purposes a little over 400,000,000 feet board measure, during the year.

The item of coal is very interesting. Obviously by far the largest amount of coal is used for steam generation, especially on locomotives and the floating equipment. Some also is used for stationary boilers, some for warming stations, blacksmith use, heating furnaces, etc. The total amount consumed was approximately 42,000 tons per day, or a little over 12,500,000 tons per year. If we assume that the average car load is 50 tons, it follows that it requires 840 cars per day or 252,000 cars per year to hold the coal required by this system alone, and if 30 cars make a train load, 28 trains per day or 8,400 trains per year would be required.

The item of iron and steel is still more interesting. Rails, track fastenings and appliances required 187,000 tons, structural steel 20,000 tons, locomotives 35,000 tons, shop use for repairs, etc., about 20,000 tons, car wheels 86,000 tons, miscellaneous castings nearly 20,000 tons, and steel freight cars 727,000 or a total of 1,095,000 tons used up by one railroad system in a year. But still further, to make this iron and steel requires not less than 2,200,000 tons of iron ore, and in addition limestone, fire clay, and other refractory materials, as well as sand, brick, stone, etc., or what may be called quarry products, in amount not less than 1,000,000 tons. To this must be added the coal necessary to reduce the iron ore, and convert the raw product into steel and into the shapes required for use. Safe figuring for this would be approximately 1¾ tons of coal per ton of steel or a total of 3,850,000 tons. If this be added to the amount used for other purposes as stated above, it results that a total coal consumption of 16,450,000 tons, or nearly 55,000 tons per day are necessary to supply the needs of one railroad system for a year.

It would be easy to expand these figures and cover cement, copper, tin, lead, zinc, and antimony, all of which either alone or in the form of alloys are used in quantities. Also tin and terne plate, galvanized sheets, paints, oils, etc., might be covered. But perhaps enough figures have been given.

As to possible economies in the future use of these materials, not very much that is positive can be said. It is beyond question that many of them are used with extreme wastefulness. The diminishing use of lumber in car construction has been referred to. It seems probable that a successful steel cross tie may be developed in the near future which will still further diminish the drain on the forests. Some recent experiments on locomotives in service indicate that 10% and possibly more of the coal now burned may be saved by proper effort on the part of the engineman, and by careful and judicious firing. The use of special steels, giving the same strength with less weight, seems to offer some prospect of saving in the iron-ore supply. But all of these possibilities require experiment and in some cases long-continued experiment for their demonstration. There is unquestionably reasonable ground for the expectation that intelligent experiment will lead to enormous saving in the use of many of the Nation's natural resources, and our firm belief is that no money appropriated by Congress, and no money expended by corporations, is more wisely spent than that which is devoted to investigation and experiment.

Such studies on combustion, on briquetting, on gas producers, etc., as are now being conducted by the Technologic Branch of the United States Geological Survey, and such experiments on combustion and the economical use of fuel as are now being carried on by the Pennsylvania Railroad Company in its locomotive testing plant at Altoona, cannot but be important factors in the conservation of our natural resources.

INTERESTS OF THE MANUFACTURER

James W. Van Cleave

PRESIDENT NATIONAL ASSOCIATION OF MANUFACTURERS

When Nature handed over to the American people the territory on which they were to build their country, she wrote on the title deed the "most favored nation" clause; and she wrote it in letters which the whole world could see.

Early in the Civil War, in an editorial on the financial expenditures of the United States, the London Times burst out into this admiring exclamation:

> What strength, what resources, what vitality, what energy there must be in a nation that is able to ruin itself on a scale so transcendent and magnificent!

This has been our disposition, in all our moods and conditions, in peace as well as in war.

And now we are warned that, at the present rate of consumption, our timber supply will be exhausted in twenty years, our natural gas in forty years, our petroleum in fifty years, our hard coal in seventy-five years, our iron ore in a hundred years, our copper in a hundred and twenty-five years, and our soft coal in a hundred and fifty years. We are here today to start a movement to stop this waste in the Nation's sources of wealth.

The manufacturer can see some special reasons for intelligent precaution which may not be quite so palpable to men in other callings.

Every hour of the day and night horsepower representing many millions of units is thrown away at the cataract at Niagara.

Down the Potomac, the Hudson, the Ohio, the Mississippi and the country's other great rivers water flows idly into the sea which, if intelligently utilized, would give profitable employment to millions of workmen.

"As much food is wasted in the United States as would feed all the people of the United Kingdom," said George Augustus Sala, the well known British journalist, who knew America and Americans well.

By devices in use on the locomotives in Germany, France, and Belgium, I am told, one ton of coal is made to do as much work as three tons do on our locomotives.

When American engineers and inventors are asked to get up contrivances which will allow us to save some of our energy and raw materials, their answer often is "We don't have to save anything. Coal and timber are cheap. So long as we make dollars we won't stoop to pick up dimes."

This theory assumes that if our iron ore, coal, and copper should ever be exhausted we can plant them, and they will grow up as profusely as cabbages. It is because this happy-go-lucky assumption has broken down that we are called here today.

As the first and most obvious necessity which presents itself to manufacturers we must, as far as practicable, use our raw materials ourselves, instead of sending them to Europe to fashion them into fabrics for us, and then buying them back at high prices. A ton of iron ore is multiplied in value a thousand times by being made into needles or watch springs. We must work it up into needles and watch springs at home. Our Southern friends, profiting by the splendid results obtained through the use of water power on Chattahoochee and Savannah rivers in Georgia, might well harness the natural water power of the South and manufacture every bale of cotton into various forms from the highest to the lowest grades and have the mills right at the edge of the cotton fields.

The Chinese Minister is quoted as saying that if the people of China should add one inch to their cotton garments all the cotton of America could not supply the increased demand.

Your attention has been called repeatedly to the reckless destruction of lands; this is startlingly true of Virginia, North Carolina, Georgia, Alabama, Mississippi, Kentucky, and Tennessee. Suppose some organized effort was made to reclaim these lands, and the cotton crop of the South was 25,000,000 bales instead of 12,500,000; by this means we might increase the number of factories, give more employment at better wages to a larger number of our workers, and equip ourselves to meet more effectively the competition in the world's markets which is becoming sharper and sharper every year. At the same time we should develop the special tastes and capabilities of all our People, make better sons and daughters, better parents, better neighbors, and better citizens of all of them, and give all of them a broader outlook on life.

Our large and rapidly increasing demand for shoes, woolen fabrics of all kinds, and many other articles of manufacture might utilize water power, if our waterways were made the subject of national concern.

Possibly invention and discovery may some day give us suitable substitutes for the coal, iron, and other resources which are being drawn upon in vast quantites now. But we must leave them as long as we can. We must do this in our own interest and in that of posterity. The well known Western politician who once asked contemptuously, "What has posterity ever done for us?" put the policy of reckless selfishness into striking phrase.

This is not the spirit which builds nations. Emphatically it is not the spirit which has spread homes, and workshops and civilization throughout the West, and which has made the United States the greatest, the most prosperous, and the most progressive country on the globe. Rather is it the "After-us-the-Deluge" spirit of the French decadents of a century and a half ago, and who went down in the deluge which their vices and follies precipitated. And I am glad to see that a widely different spirit brings all of us here today.

The thoughtful father wants to leave his children more than his own father gave him. This must be the rule of conduct toward the millions of our countrymen who will follow us. This rule compels us to—

(1) Fashion our raw materials into fabrics in our own workshops, and thus lengthen out their existence.

(2) Put into use many of the industrial economies which necessity forces Europe and Asia to practice.

(3) Offer premiums to our own inventors to devise new economies and short cuts.

(4) Place a manual training department in all our public schools, and equip the hand and the eye of every child in the use of mechanical tools. An illustration: In my home city, St. Louis, we are very proud of our public schools and spent $3,500,000 last year in maintaining them. There were 20,000 boys enrolled at the beginning of the present school year in September last. Our records of previous years show that less than 800 of these boys enter our high schools per annum, less than 200 entered the schools of technology and college, thus proving that we allowed more than 18,000 of these boys to get out of school through necessity or the ignorance of their parents. We have turned these boys out into the world without any training of hand and eye, through which they might cope with the world.

(5) Make each unit of our materials do more work and better work than it does now.

(6) Ostracise a spendthrift in natural resources as we now ostracise a drunkard or a debauchee.

The workshops of the country will have a particularly powerful incentive to promote reforms which this gathering aims to set on foot.

I think I am safe in promising the earnest cooperation of the National Association of Manufacturers in carrying out the good work which the author of this meeting has in mind.

Our Association, probably more than any other body of men in this country, should have this great movement at heart. It is the manufacturer who consumes in great part the raw material, the ores, the timber, and the fuel which we now feel should be conserved, and it seems to be fitting that the manufacturers should be among the first to see that waste is not permitted. The National Association of Manufacturers as an organization will take up this important subject at its convention next week and practical plans will be formulated to further the aims and purposes of this present Conference.

At this hour we are standing on the dividing line between a great past and a broader and grander future. As representative of 85,000,000 People we are called upon to consider the needs and to assist in shaping the destinies of the 350,000,000 who will be here 200 years hence.

Let us make this year a great landmark in the country's progress. Let us take steps to hand over to the generations which come after us more and better things than the preceding generations passed on to us.

Let us today start a movement at this center of the Nation's power, which, in its field, will make 1908 stand out on the calendar of American history as conspicuously and as beneficently for the thousands of millions who will appear in the coming centuries as 1776 stands out for every person who is here at this hour.

CONSERVATION OF SOILS

Charles Richard Van Hise

PRESIDENT NATIONAL ASSOCIATION OF STATE UNIVERSITIES

In his very impressive paper on "The Natural Wealth of the Land and its Conservation," Mr Hill has given a comprehensive picture of the importance of our soil resources, and a severe arraignment of our want of foresight and reckless extravagance which unless checked in the near future threatens to impoverish our Nation in its most fundamental asset.

There can be no question about the correctness of Mr Hill's position as to the profound importance of the conservation of the soil. Food and clothing, products of the soil, we must have. All of our other wants are subordinate to these.

Mr Hill says: "Our agricultural lands have been abused in two principal ways: first, by single cropping, and second, by neglecting fertilization." In reference to these abuses, he says: "The two remedies are as well ascertained as is the evil. Rotation of crops and the use of fertilizers act as tonics upon the soil. We might expand our resources and add billions of dollars to our national wealth by conserving soil resources, instead of exhausting them, as we have the forests and the contents of the mines."

Mr Hill fails to mention one of the great causes for the depletion of the soil, that of soil wastage through erosion; but this aspect of the subject is handled by Professor Chamberlin in another paper, submitted to the Conference, therefore I shall not discuss the dumping of the soil into the sea by the rivers in incredible quantities through cultivation without reference to the conditions necessary to prevent erosion. McGee and others have painted woful pictures of the frightful loss of soil by erosion, which has wasted away the upper part of the soil over a large part of many States and which has even converted extensive areas into bad-lands.

Neither shall I more than mention the question of rotation of crops. One of the chief purposes of rotation is obvious: A crop of one kind draws heavily upon certain elements of the soil; another does not demand so much of this element. Therefore it is plain that by rotation of crops the elements of fertility may be drawn upon more slowly and proportionally, and thus through proper procedure, enable the farmer to retain in the soil an adequate supply of each of the important elements.

The subject to which I wish to ask your attention for a few minutes is that of fertilizers. Mr. Hill says: "Use fertilizers as tonics to the soil." This naturally raises the question as to our resources in these materials. The three plant foods which are most likely to be present in insufficient quantity in the soil, and which are most expensive to supply, are nitrogen, potassium, and phosphorus.

Fortunately, in the atmosphere is an inexhaustible quantity of nitrogen. The problem is to get this free nitrogen into a form in which it can be used by plants. Until comparatively recently, this was regarded as almost hopeless; but the discoveries of recent years show that there are two ways in which the nitrogen of the air may be fixed. The leguminous plants, by the aid of bacteria, combine nitrogen in large quantities with other elements, and add it to the soil in a form that may be used by nonleguminous plants. By electrical methods, also, nitrogen may be directly combined with other elements. Thus so far as this element is concerned the problem is solved. By applying the knowledge which science has furnished us, the soil need never lack the nitrogenous element of plant food.

In the original igneous rocks, the average percentage of potassium is about two and one-half. However, there are inexhaustible masses of rock in which the percentage is about three times this average. Therefore the total amount of this element is practically unlimited.

By nature's processes, potassium has been extensively abstracted from the original rocks, and has been concentrated so that in various parts of the continents there are large quantities of this element in a readily soluble form in which it is available for fertilizing the soils deficient in it. Even if in the future these segregated and soluble deposits of potassium are exhausted, we may still use the original rocks, which are more than ordinarily rich in this element, as a source from which more concentrated material may be manufactured, or the very finely pulverized rocks may be used directly as a fertilizer.

The only remaining element about which we need concern ourselves is phosphorus. This is the element which, so far as we can see at the present time, presents a profoundly serious problem in maintaining the fertility of the soil. Clarke,[a] in his "Data of Geochemistry," estimates that the crust of the earth contains only 0.11 of 1% of phosphorus, or about 0.25 of 1% of phosphoric oxide. As we have just seen the average rocks contain twenty times as much potassium. Therefore, looking toward the distant future, if we consider ratios, we may unhesitatingly assert that the problem of maintaining the fertility of the soil in phosphorus will be twenty times as difficult as for potassium; but this ratio by no means measures the real difference, for when a deposit contains a moderate percentage of a substance it may be possible to utilize it commercially, whereas if the percentage falls below this amount, it is without value.

It is one of the great laws of nature that under favorable conditions the forces and agents of rock-alteration tend to segregate locally each of the elements. To such processes of segregation are due the available metallic ores, since the average amounts of the valuable materials in the rocks are far below those in the workable ore deposits.

The segregative processes of nature have fortunately concentrated phosphorus in various ways, and these deposits are the chief source of supply of our phosphates.

The earliest phosphatic fertilizer to be used was guano, mainly derived from the islands off the western coast of South America. If the segregation of phosphorus in guano were fully described, it would be appreciated how slow and intricate is the process of concentration of a rare element.

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[a] United States Geological Survey, Bulletin No. 330 (1908).

The story would involve, first, the solution of the widely disseminated phosphorus from the original rocks, its segregation through complex processes in the small plants and animals that become the food of fishes, which in turn become the food of the sea-birds. The dry excrement of the sea-bird constitutes the guano. Much of the guano contains 25% to 40% of phosphoric oxide. Thus nature's processes of segregation have multiplied the amount of phosphorus in the original rock from a hundred to more than [illegible] hundred and fifty-fold.

Garcilaso de la Vega,[a] in the sixteenth century, gave "a very interesting account of the manner in which the birds producing the guano were protected by the laws of the Incas of Peru, by which it was made a crime, punishable by death, to kill the sea-fowl, to gather their eggs, or even to visit the islands during the breeding season."

A recent report by Robert Coker[b] to the government of Peru on the future of the guano industry and the guano-producing birds, tells of "the robbery of eggs on a large scale in past years, the destruction of young and old birds, and the disturbance of the birds in their nesting-grounds by the extraction of guano." He says an inevitable result "has been a great diminution in number." Mr Coker's report pleads for regulations to increase the number of birds and thus to perpetually maintain a large supply of guano. With reference to the most precious of the fertilizers, this twentieth century presents an ignominious and startling contrast with an ancient civilization. In considering the ill-treatment of the guano-producing birds, it is difficult for one to retain composure and speak with moderation of the odious combination of human greed and brutality exhibited by this case of exploitation of a natural resource, in complete ignorance and absolute disregard of its effect on the future of our race. The phrase "killing the goose that laid the golden egg" was never more applicable.

Long before Man existed on the earth, the ancient phosphatic segregations of birds and other animals, formed on an extensive scale, were buried among the sediments and have been partially preserved in the rocks. These deposits constitute the chief sources of our mineral phosphates. Until recently the most extensive known deposits were those of Florida, South Carolina, and Tennessee. In the year 1907, in these States almost exclusively, 2,265,343 tons of phosphate rock were produced. While the amount exploited is now large, none of the scientists who have examined these deposits hold out any hope that their extent is so great that they can be relied upon as a source of phosphate fertilizer for more than a very brief period, at most a few decades or a few score of years.

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[a] Johnson's Universal Ency, Vol. 4, p. 52.

[b] Science, July 10, 1908, p. 60.

Aside from these southern phosphates, we gain small amounts of phosphorus as by-products in the concentration of the magnetite iron ores, and from the slag of steel manufactured by the basic and open-hearth processes. These operations segregate the small amounts of phosphorus in the iron ores, so as to give the by-product a marketable value; but from these sources we cannot expect more than an insignificant fraction of the phosphatic fertilizer required by the agricultural interests of the United States.

Fortunately, recent investigations[a] by the officers of the United States Geological Survey have shown that in Utah, Wyoming, and Idaho, are phosphatic deposits, regarded by Weeks and Ferrier, the reporting officers, as more extensive than have as yet been known to exist in this country.

At a number of places a rich phosphate bed five or six feet thick has been found, and above this bed are from fifty to one hundred feet containing thin layers of phosphate. While this western supply of phosphate is doubtless large, the explorations have been far too scanty to warrant any quantitative statement; and even under the most favorable hypothesis of continuity throughout the formation in which they exist (and of this they are sure to fall far short), they would still not be adequate to meet the needs of the Nation through the centuries to come.

And yet the phosphate deposits of Utah, Wyoming, and Idaho remain practically untouched, and from the point of view of the speaker are one of the most precious of the natural resources of the Nation, having a value inestimably greater than might be supposed from the present marketable value of phosphate rock.

In Canada there are areas of crystalline rocks in which phosphates have been locally segregated. Also in other countries there are phosphatic deposits; but on these foreign supplies we can in no way depend. The demand for phosphatic fertilizers by the agricultural interests of each country is sure to be so great that it may be confidently predicted that in the near future no nation will permit the exportation of phosphates, with the possible exception of countries like Peru, where large quantities are being produced each year through bird life.

With the exception of our deposits of coal and iron, so far as real value to the Nation is concerned, the western phosphate deposits are probably the most precious mineral possession of the Nation. They are now rapidly passing into private hands. It is my hope that our wise and courageous President may find some legal way to preserve these deposits to the Nation, even as he has conserved the last great remnants of our forests.

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[a] Investigations relating to phosphates and phosphorus in 1907, F. B. Weeks, and W. F. Ferrier, Bulletin No. 315, United States Geological Survey. Investigations relating to phosphates in 1907, F. B. Weeks, Bulletin No. 340, United States Geological Survey.

The general and alarming decrease in the crop-yield per acre in the various States, so well described by Mr Hill, is largely due to the depletion of the soil in phosphorus. This is clearly shown by the investigations of the various agricultural stations. In order that the present relatively small productivity of the Southern States may continue requires the use each year of many thousands of tons of phosphate fertilizer. Even the soils of the rich Central States, the garden of the United States, are deficient in this important element. The experiments of the Ohio station show that the use of phosphatic fertilizer largely increases the crop-yield, and is a source of great profit to those using it. Indeed, their work on different fertilizers showed that "for the soils tested in the experiments, phosphorus was the controlling element in producing an increase of the cereal crops."[a]

Even for Illinois, correctly regarded as one of the most fertile States in the Union, an extensive investigation by the State experiment station shows that "None of the soils are very rich in phosphorus, while many of them are considerably below the standard fertile soil, and two or three soils of large area are markedly deficient in that element, particularly by the large areas of so-called white clay soil."[b]

These studies in Ohio and Illinois are confirmed by quantitative studies in Wisconsin. Whitson finds as a result of the average of nine typical tests that "the surface eight inches of virgin soil contains 2,877 pounds of phosphoric oxide per acre, while that of the cropped fields contains but 1,813 pounds, an average loss per acre on these cropped fields of 1,064 pounds, or 36% of its original content. The average period of cropping for these fields has been 54.7 years." In other words, during the past half-century, in Wisconsin one-third of the original phosphorus of the soil has been lost in the cropped fields. What has been proved for Ohio, Illinois, Wisconsin, and other States where tests have been made, is unquestionably true for the remaining States in the country which have been settled for some time.

In what condition will the soil of the United States be as to phosphorus content fifty years hence, if this process of depletion be allowed to continue unchecked?

The phosphorus which is taken out of the soil by cropping could be largely returned to it if all the manure of the domestic animals were saved and utilized. The experiments of the Ohio station show that the manure from domestic animals retains more than three-fourths of the phosphorus contained in the food and bedding, a large part of the remaining one-fourth being built up in the systems of the animals. Thus if the excrement from all domestic animals, both in town and country, were returned to the soil, more than three-fourths of the phosphorus would go back to it. But as yet our agricultural population is most delinquent as to the manner in which they handle the feces and urine of the domestic animals. The agricultural colleges and experiment stations, through teaching the students and through extension, have a heavy responsibility in this matter of the waste of the valuable fertilizers, and especially the phosphates.

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[a] Ohio State Agricultural College, Bulletins Nos. 141, 182.

[b] Illinois Agricultural Experiment Station, Bulletin No. 68.

The phosphates which pass into the bones of domestic animals, so far as they are killed in the great abbatoirs, become valuable by-products, which are sold to the farmer, and thus are returned to the soil.

There remains only to consider Man as a source of phosphates. In this country there has been as yet practically no attempt to return the human excrement to the soil. This is true of both country and city. In the country the solution of the problem of handling the human excrement, so as to use it as a fertilizer, is comparatively easy, but the education of the farmer so that he will apply the solution will prove a difficult task which must be taken up at many thousands of centers. At the present time, through our concentrations into cities and towns and the running of sewage into the streams, a large proportion of the human excrement, as well as that of animals, all rich in phosphorus, goes to the rivers and thence to the sea, so that there is vast and unnecessary loss of the phosphates. Whitson estimates that the loss in the cities due to human excreta alone is the equivalent of 2 or 3 pounds of phosphoric oxide per acre for the entire cropped region of the United States. Supposing this loss to be 2 pounds, or one one-thousandths of a ton, this amounts for the 400,000,000 acres to 400,000 tons of phosphoric oxide, or equivalent to 1,200,000 tons of phosphate rock. The method of sewage disposal should be wholly abandoned and the phosphates of the sewage returned to the soil. The saved phosphates alone would more than justify the cost, without taking into account the enormous advantages of freeing the living water from pollution.

The wide dispersal of vast quantities of phosphorus, which it took the processes of nature an indefinite period to segregate, must cease. The loss is irreparable. In this matter we may well turn to China and Japan for guidance. The evidence is clear that the people of these ancient nations, which have had a dense population for many centuries and have preserved the fertility of their soils, have carefully saved and utilized animal and human excrement.

In the year 1906, of the somewhat more than two and a quarter million tons of phosphate rock produced in the United States, more than 30% was exported; and since the richer rock was sent abroad, more than this proportion of the value of the material as a fertilizer went out of this country.

At the present time there is need for much more phosphate rock than we now raise to neutralize the annual loss of the soil due to the waste of animal and human excrement. Whitson's investigations show the loss of phosphoric oxide in the fields tested in Wisconsin to be annually about 20 pounds per acre. To be conservative, let us suppose that the average loss for the United States is but half of this amount. For 400,000,000 acres, less than the total of the cropped land, this would represent an annual loss of 2,000,000 tons of phosphoric oxide; but since the phosphate mined is only about one-third phosphoric oxide, to supply this amount would require 6,000,000 tons of rock.

If we suppose the accumulated loss of the soils of the United States from natural conditions due to cropping is one-half that found by Whitson in the fields tested in Wisconsin, the amount would be a quarter of a ton per acre, and for 400,000,000 acres, 100,000,000 tons of phosphoric oxide, which is the equivalent of 300,000,000 tons of phosphate rock. Thus, to make good the phosphorus already lost to the soil in the United States by reckless disregard of the future would require the present output of our mines for more than a century, even if at once it were possible to prevent further depletion of the soil and no more of our phosphate rock were required to neutralize the current waste.

In Sweden the government decides as to whether it is wise to allow iron ore to be exported, and limits the amount which may be sent out of the country each year. If the statements presented in this paper are true, there should be a law prohibiting exportation of a single pound of phosphate rock. With the teeming millions which are to occupy this country, estimated by Mr Hill to be more than 200,000,000 within a half century, we shall sorely need—indeed we now sorely need—all of our mineral phosphates. In this matter we should think not merely of the next fifty years but of the future centuries.

The foregoing remarks show that the arraignment which Mr Hill makes as to the reckless extravagance of the American is confirmed in every particular when considered with reference to that most precious constituent of the soil—phosphorus.

Hopkins[a] well says: "If he who makes two blades of grass grow where but one grew before is a public benefactor, then he who reduces the fertility of the soil so that but one ear of corn grows where two grew before is a public curse."

That Nation only can reach the highest intellectual and spiritual level which is well nourished. Nourishment requires food. Food depends on the necessary elements to feed the plants in the soil. Of these we can see no future danger so far as nitrogen, sodium, and potassium are concerned; but because phosphorus is relatively so rare an element, because it has been segregated by the processes of nature in so limited an amount, and since it is so essential to the growth of both plants and animals, it is clear that we should exercise the utmost foresight in conserving the natural concentrations of phosphorus and retaining that still in the soil.

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[a] Illinois Agricultural Experiment Station, Bulletin No. 68.

We should work with the natural agents of the earth rather than reverse their work, as we have been doing since American settlement began. If the call of President Roosevelt for this Conference results in the conservation of the phosphates in the soil, and the retention for our People of the mineral phosphates of the country, this alone will have justified the call many-fold.

THE TWILIGHT ZONE

SETH LOW

PRESIDENT OF THE NATIONAL CIVIC FEDERATION

By papers which have been read during the Conference, two thoughts have been suggested which it seems worth while to make a matter of record in this connection. Great emphasis has properly been laid on the necessity of securing the cooperation of both the States and the Nation in the matter of forest preservation and in the matter of reforestation. It is perhaps worth while to point out that it is hardly less important to secure the cooperation, so far as possible, of the private owners of timber land for the furtherance of both of these ends. Any such cooperation on the part of private owners is not at all unlikely to involve, especially if any limitation of the cut is to be considered, some agreement in restraint of interstate trade; and, if so, such an agreement would be unlawful under the terms of the Sherman Anti-Trust Act, as interpreted by the Supreme Court of the United States. In other words, if the cooperation of private owners of timber land is desired, some amendment of the Sherman Anti-Trust Act that would make agreements between lumbermen lawful may be absolutely necessary.

Mr Bryan in his interesting paper said that there was no "twilight zone" between the power of the States and of the United States. It may be worth while to point out that, in connection with the regulation of interstate trade, there is precisely such a "twilight zone." The States can control the agencies which do interstate trade, because the States create them; but the States can not control or regulate the interstate commerce which these agencies do. On the other hand, the United States can control the interstate commerce that is done, but can not control the agents that do the interstate commerce. In other words, neither the State sovereignty nor the National sovereignty covers both the agents and the interstate commerce that they do. I submit that this is, in effect, a "twilight zone," and that the remedy must be sought either by means of a National license for interstate business, or by means of a National incorporation of the companies that do interstate business; so that the sovereignty which controls interstate business may have something to say not only as to the business that is done but as to the agents that do it.

There are few subjects more important than this demanding consideration in the near future; and some solution of this question which will abolish the existing "twilight zone" may have a very vital relation to the conservation of the National resources.

NECESSITY FOR WATERWAY IMPROVEMENT

CHARLES J. AUSTIN

PRESIDENT NATIONAL HAY ASSOCIATION

When I received the invitation from President Roosevelt to attend this Conference as the executive head of the National Hay Association, the thoughts uppermost in my mind were the honor conferred on our organization, and just what relationship hay can, from any standpoint, bear to conserving the natural resources of the country; and it was with more or less misgiving that I accepted, thinking that possibly our trade would take up room that might better be occupied with other interests of more benefit to the purposes sought.

However, having accepted, I immediately set about seeing just what I could do to help, and at the same time bring to the notice of this distinguished gathering a crop annually harvested, and whose aggregate last year was 66,000,000 tons, and footed up in value second to corn only.

The relationship of this large crop to the waterways is in my opinion germane, to the extent that during the months of navigation a large part of shipments are consigned by water, and could be very largely increased if existing waterways were navigable. In New York State, as you know, provision has already been made for a barge canal, which when finished will render the commerce of the United States untold assistance.

The whole country is familiar with transportation conditions during the past two years and up to last October, and I venture the opinion you are all well acquainted with actual losses, and many of them too, incurred through lack of facilities to move the crops and other commodities, and the hay interests suffered in common with everything else.

The Association which I represent numbers among its members nearly 1,000 firms, who as individuals handle nearly 75% of the crop of hay for export or home consumption, and I believe that this Association may be of practical use in assisting in the conservation of our natural resources to the extent that it is conversant with the actual needs of all sections of our country, both sea-board and inland, and stands ready to assist, whenever and wherever it can when called upon to do so. I as its executive so pledge it.

Many commodities of a like bulk need water transportation, and a solution of this trouble would relieve the question of future congestion and inadequate transportation. I have read that it will take an enormous amount of money to put the railroads in shape to handle future traffic, which in any event would not be lasting, and at the end of a few years the same work and improvements would have to be done over again. Why not spend one-half of this estimated sum on the protection of our forests first and the balance upon improved waterways? Then, and only then, I believe we will have accomplished the desired result.

It is a well-known fact that water transportation is cheap, far cheaper than rail, and the question of expense enters largely into the conditions of any successful undertaking; and the item of storage bills during the past two years has been a factor in many a man's enterprise, as no doubt many of you know, largely because of the fact that the goods could not be moved when desired.

I have heard it said that at the rate electricity and gasoline are supplanting the horse you would not very long need hay or oats, and the land so used could be planted to trees. Let me tell you, Gentlemen, that the consumption of hay for 1907 was at its height, and it is not diminishing. The horse and his uses are far from dead.

I find at the American Forestry Congress, held in 1905, this Association was represented by a former President, Mr Charles England, of Baltimore, and the counsel of the Association, Mr John B. Daish, of Washington, and that in the report submitted by them and transmitted at its Annual Meeting to the Association in 1905, through the Board of Directors, it was recommended that the Association do all it could to further the interests resulting from this Conference; and to cooperate when asked by the proper authorities, which has been done.

I venture to say many propositions will be presented to this Conference; yet in my humble opinion, in order to properly bring the subjects uppermost in the minds of this assemblage before Congress, the Governors of each State and Territory should appoint at once a commission of five members, consisting of the most able and available president of a college, within the State if possible, a practical business man familiar with the wants of the agricultural interests and their requirements, an expert on forestry, an experienced traffic man, and an engineer of note, with the Governor ex officio. This committee should ascertain just what ought to be done within their individual State, then request that each committee send a committee of two of its members to Washington not later than the first Monday in December, 1908, to meet in a general conference with the Inland Waterways Commission and agree on a program to present to Congress which will conserve the interests at stake. Following such a plan, I can not see why Congress should not afford the necessary relief, which the master mind of the Executive of the United States was far-sighted enough to know was needed, and courageously put in action the machinery that resulted in this Conference.

Permit me, Gentlemen, to extend to this assemblage, and to the Inland Waterways Commission particularly, the hearty cooperation of the National Hay Association at any and all times.

FIRE PREVENTION

Powell Evans

This Conference, remarkable in its scope and composition, owes its birth to the economic waste in many directions characterizing the National life and activity of the People of the United States. The topics of greatest importance are those which concern the undisputed waste which has marked and still accompanies the use of our National natural resources. Proper consideration of these questions, however, at once leads to associated subjects which seriously affect the welfare of the country's entire population, and which by their very nature can only be indirectly controlled by the National Government, but yet demand prompt and concerted action on the part of the several States.

The United States Inland Waterways Commission and Forest Service Bureau have during the past year urgently called attention to the widely ramifying injury inflicted on the country at large by the rapid destruction of our forests. There are three principal causes of forest waste, viz: (1) fire, which occasions over one-third of this destruction; (2) the size of the lumber cut (about 40,000,000,000 feet for 1907, or 8 to 9 times that of Europe, per capita); and (3) the unnecessarily destructive methods employed in cutting our timber.

Fire loss generally in the United States is closely associated with the first two causes of forest waste above defined. The tremendous forest fire waste is paralleled by proportionate fire loss in artificial wealth, as will be shown below. Obviously the admittedly unnecessary amount of all this fire waste must arise primarily from thriftless and indifferent public opinion. Public opinion, if aroused and educated on this subject, would operate to reduce all fire waste to its reasonable proportions. Again, the undue fire waste of artificial property all over the country arises to great extent from the use (and the unnecessary use, as better substitutes can be employed) of too much timber in building construction.

Restriction on the use of timber in city building would operate substantially to reduce fire loss, and at the same time materially to reduce the demand for timber, thus requiring a smaller annual cut, and this principally for use in the arts, where no satisfactory substitute is obtainable.

Hence any step leading to reduced fire waste would operate both to elevate public morals on the subject and to reduce the consumption of timber—a two-fold help toward forest conservation.

I will now outline the size, nature and the initial remedies for the artificial fire waste of the country.

The danger of fire, in destroying property, in the interruption of business, and in creating a permanent charge on income, is a menace to our entire business world; while at the same time it presents an ever-present risk to life in the house, the shop, the factory, and in all places of assemblage, all of which touches every citizen of the country closely all the time and everywhere.

Fire prevention is the general term applied to the science of so constructing, protecting and occupying buildings as to minimize the danger of fire; and must not be confused with the narrower definition of "fire protection" applied to the mechanical aids employed to discover, resist and fight fire.

The annual fire loss of the United States, on a ten-year average, for the years up to the end of 1902 (prior to the great Baltimore and San Francisco fires) was $146,552,365; and up to 1908 was $198,181,188.

The tremendous size of this waste may better be realized when measured with familiar items in our national expenditure.

The annual ten-year average fire loss up to the end of 1906 compares as follows with the like averages of the items given below:

36%	United States Government total receipts	$554,390,238
37%	Net earnings railways in United States	542,274,762
37%	United States Government total ordinary expenditures	532,018,116
76%	Interest paid by railways in United States	261,044,569
78%	United States internal revenue receipts	253,400,164
79%	United States customs	252,359,639
122%	Dividends paid by railways in United States	162,124,558
141%	United States pensions	140,861,166
152%	United States postoffice receipts	130,201,926
156%	Commercial failures in United States (liabilities)	126,646,386
157%	United States War Department cost	126,465,728
165%	Fire Insurance loss payments	120,352,198
180%	United States gold production United States silver production } (coining value)	109,805,439
242%	United States Navy cost	81,871,647
648%	Interest on United States national debt	30,568,000

The total 1907 fire loss was $215,671,250.

In January, 1908, by far the worst record ever known was made in the fire loss sustained in the United States and Canada, aggregating $29,582,600, approximately $5,500,000 more than for January, 1907, and $12,000,000 more than for January, 1906 (including 460 odd fires exceeding $10,000 loss in each instance).

In April, 1908, the United States and Canadian fire loss was $26,669,000, approximately exceeding the same month of 1907 by $5,000,000 (including 376 fires reaching or exceeding $10,000 loss each).

The United States and Canadian fire loss for the first four months of 1908 was $91,464,600, or at the annual rate of $275,000,000 for both countries (the share of the United States being higher than for any like average previous period).

All these figures conclusively prove the constant increase in fire waste, but do not represent all the cost imposed upon the country from this cause. The cost of insurance is the measure of this amount, and even this does not represent the full cost to the Nation, as the expense of municipal fire protection and departments must also be included in estimating the total burden.

About 630 stock and mutual fire insurance companies during 1907 wrote approximately $30,000,000,000 of risks for which they received $301,038,893 cash premiums.

Not all the property burned in 1907 was insured. Nevertheless the cash premiums received by these fire insurance companies during this year show an actual average cost to the People of the United States of $1.40 for every dollar of fire loss.

It is stated by fire insurance authorities that an average of 60 cents out of every dollar of premium received is used to pay insured fire loss. With these figures as a basis it will be possible, by reducing fire waste, for the public to save on an average at once all uninsured value now burned, and in time 1⅔ of all insured values now burned.

HOW CONSERVATION OF MINERAL RESOURCES CAN BE ACCOMPLISHED

J. A. Holmes

CHIEF TECHNOLOGIC BRANCH UNITED STATES GEOLOGICAL SURVEY

The Governor of Indiana has raised an eminently pertinent question, namely, How can the conservation of resources be brought about?

For the conservation of forests the way seems comparatively clear. The great problem is to arouse the American People to action. The

Federal Forest Service has already begun a splendid work in the care and extension of the national forests, and in general educational work throughout the country. Several States have organized forest commissions for the purchase and reforesting of lands not suited for ordinary agricultural purposes; and this is a great work which every State can do. Each State can by tax adjustment and in other ways make it to the interest of its citizens to preserve and extend forest on their private lands.

The conservation of our soils can also be easily brought about by proper croppage, culture, terracing, draining, and so forth—reforms already begun, but with an enormous amount of educational work yet to be done in their behalf by the Federal, State and private agencies, in carrying this movement forward to conditions which should exist.

Conservation of our water resources, though somewhat complicated by legislative difficulties, is bound to go forward with the conservation of soils and forest along certain well-defined lines, if the people of this country will act advisedly.

In each of these cases the comforting feature is, that while by destructive interests and habits we have gone a long way in the waste of these resources, there is a re-creation possible; and by serious, long-continued, widespread, cooperative effort, we may not only maintain, but we may steadily improve the existing conditions. By extending our forests, building storage reservoirs, and the judicious care of our soils we may have timber, and water, and abundant recurring crops for the hundreds of millions of American Citizens who will people this country through the future centuries.

But by far the most serious problem before the Nation in this conservation movement is the approaching exhaustion of its mineral resources—resources of which there are no recurring supplies, no re-creation with the seasons—and the exhaustion of which when once accomplished is a permanent exhaustion. There is no interest accruing; and we are rapidly and continuously depleting our principal.

The opening address by the President, the papers by Mr Carnegie and Professor White, and the discussions of different phases of this subject by Mr Mitchell, Mr Hammond, President Van Hise, Governor Johnson and others, have set forth with admirable and convincing clearness facts concerning our mineral resources which demand attention, and which can not fail to impress everyone as to the need of conserving these resources. But the question which naturally arises is this question raised by the Governor of Indiana: How can this be done? Can we so extend the life of our supplies of mineral materials as to meet the real needs of the present century, and at the same time save something for the no less real needs of the generations of American citizens which are to come after us? Can this be done without curtailing the needs of the present generation, and without too seriously interfering with the rights and opportunities of the present holders of these properties?

SOME THINGS WE CAN NOT DO

Assuming that the above questions can and must be answered in the affirmative, let us first endeavour to clear the situation by getting rid of certain prominent negative propositions:

(1) We can not deny the power nor the right of the present generation to use efficiently so much of these resources as it actually needs.

(2) We can not curtail present needs; and these needs will increase as there is increase in the Nation's population, and in the extent and diversity of its industries.

(3) We can not expect the men of this generation to mine, extract, or use these resources in such manner as to entail continuous financial loss to themselves, in order that something be left for the future. Unless there are profits associated with mineral industry there will be no mineral industry.

First of all we must have—

A RATIONAL BASIS FOR CONSERVATION

One of the essential steps in this movement is to secure the adoption of the fundamental principles which give conservation as applied to mineral resources this rational basis. Some of the more important of these principles, which should be considered in connection with the preceding propositions, are as follows:

(1) These resources, which have required countless ages for their accumulation, which when once exhausted are not reproduced, and for which there are no known substitutes, must serve as a basis of the future no less than the present welfare of the Nation. No human agencies, no present owners of these resources, have contributed toward their accumulation, or to their intrinsic values. In the highest sense therefore they should be regarded as property held in trust for the use of the race rather than for a single generation, and property for the use of the Nation rather than for the benefit of the few individuals who may hold them by the right of discovery or purchase.

(2) Measured in terms of the needs of a great and rapidly growing Nation, the mineral resources of this country are limited in quantity.

(3) Measured in terms of the life of the Nation, at the present increasing rate of consumption and waste, we will while the Nation is yet in its infancy exhaust permanently resources intended as the essential basis of the welfare of all its succeeding generations. To shirk this responsibility

with the claim that these succeeding generations will discover other now unknown resources for their use is even more illogical and unwarranted.

(4) The right of the present generation to use efficiently of these resources what it actually needs, carries with it a sacred obligation not to waste this precious heritage.

(5) The right to profit in the mining and subsequent use of our mineral resources does not carry with it the right to destroy the birthright of generations yet unborn in order that we of today may obtain more easily and more cheaply the products we need for present use.

(6) It is therefore reasonable to expect that the users of mineral products will pay for them such higher prices as will make profitable their mining and preparation without serious waste.

(7) It is also reasonable to expect that the resulting increase in the first cost of the crude material will ensure their more efficient use, and that this in turn will both help to keep down the ultimate cost of finished products and to conserve the resources.

(8) The very abundance and cheapness of our resources have developed an American habit of waste which is the greatest menace to our future welfare. This waste, of the past and present, entails on us a still greater obligation to strive for the highest possible efficiency in the future mining and use of these resources.

(9) So long as men are human, self-interest will naturally dominate the policy and action of individuals and corporations; and these policies and actions relating primarily to the question of temporary gain are not always in accord with the best interests of the Nation. To the Nation alone can be entrusted the guardianship of its own future. This conservation of resources is therefore a great national problem and a great national duty.

HOW CONSERVATION CAN BE ACCOMPLISHED

(1) *Through investigation*—We must find out the important facts in each case; the nature and extent of each of the country's important resources; the rate at which each resource is being utilized; the purposes for which each is being used; the purpose for which each is best adapted. We must determine the nature and extent of the waste in the mining, extraction and use of each mineral product; how this waste can be prevented; how each product can be used with increasing efficiency, so that on the morrow one pound may do the work which today or yesterday required the use of two pounds or more. We must find out to what extent it may be possible to discover and develop substitutes which may in part or entirely take the place of, and thus lessen the need for, other products of importance of which the supply is limited; and we must

discover methods for utilizing properly by-products or other materials for which under existing conditions there is no commercial demand and which are therefore permanently wasted as having no value.

During the past year, for example, it is estimated that more than 300,000,000 tons of coal were permanently lost in mining 480,000,000 tons, for the reason that being of low grade, or high in sulphur, or being needed to support the roof it could not be mined with safety or profit under practices now in vogue.

It is the purpose of the Federal Government, in its fuel investigations now under way, to indicate how this enormous waste can be avoided with profit to the operators and with enormous saving to the Nation. And all such investigations, whether by the Federal or State authorities, should be extended until every phase of these important problems has been investigated and the facts laid before the public.

The investigations of the Federal Government may properly be devoted to the general problems of interest and value to the Nation as a whole, thus avoiding the costly duplication of effort and funds which would result if each of a number of States were to take up such investigations separately; while the investigations by the States might properly cover all local problems and matters requiring State legislative supervision.

As a further single illustration showing the imperative demand for such investigations, we need only recall statements presented before this Conference that of the 200,000,000 tons of coal used for power development in the United States during the past year (including that used on locomotives) only about 5% of the heat, or the equivalent of 10,000,000 tons of coal, was converted into actual work. And of the coal used in electric light power plants not more than one-fifth of 1% was actually converted into light, the remaining 99 4/5% of the heat being consumed in warming the atmosphere and in the various preliminary transformations of energy.

(2) *Through educational work*—The information obtained from all sources should be carefully digested and placed before the People of the country with a degree of impartiality and accuracy that will command respect and confidence.

Having grown up in the luxury of the world's greatest assemblage of natural wealth and having developed the habit of waste, the re-education of the American People to a realization of the need for this conservation of resources which they have been taught to consider as "inexhaustible" is no small undertaking, but it can be accomplished. And unless the present generation does understand that these resources are exhaustible, those who come after us, and for whose interests we are the responsible guardian, will but inherit the unsatisfying record of resources already exhausted.

If by investigation and educational work the People can be shown how they can mine and utilize profitably mineral resources with increasingly less waste, the victory is already well-nigh won. Failing in this, we must find some way of increasing the price of the product sufficiently to meet this increase in the cost of the less wasteful methods of mining and treatment or use of these resources.

(3) *Through legislation*—If from time to time individual or corporate interests persist in the pursuit of wasteful methods with a view to increased immediate financial return and regardless of the rights of the future, legislative measures in the various States may prove necessary. If so, the data obtained through these investigations will serve as an intelligent basis for such legislation; and an educated public opinion will at that time be a sufficient guarantee that such legislation will be wisely framed, enacted and enforced.

In the mining of coal and some other minerals present prices of the product must be increased before there is possible that higher but more costly efficiency in practice which is necessary if we are to eliminate the larger part of the enormous existing waste referred to above. And legislation intended to prevent this waste in the mining and utilization of mineral resources must also permit such cooperation among those engaged in the mining industry as will secure the increase in prices of products necessary to cover the greater cost of clean mining.

Let us understand clearly that in the mineral industry there are two kinds of waste:

(*a*) That which is unnecessary, because it can be prevented under existing commercial conditions. Such, for example, is the turning loose in the atmosphere of enormous quantities of natural gas. Such waste is a crime against the Nation. And Indiana is the one State which has prohibited such waste by law. Equally criminal are the wholesale burning of our forests, the washing away of our soils, and other items which I need not stop to mention. All such waste should be prevented by adequate legislation in each of the States.

(*b*) The waste which may now be necessary for the reason that under existing commercial conditions, and in the present state of our knowledge, it can not be prevented without entailing continuous financial loss.

In cases of this class the necessary may be transferred to unnecessary waste by either or both of two processes: (a) Investigations may indicate improved processes through the application of which materials may be mined or extracted or used more efficiently and hence with less waste, even at prevailing prices; or, (b) prices of the commodity may be increased sufficiently to render practicable this more efficient mining or treatment or use even in the present state of our knowledge; or, (c) pending readjustment under one or both of these situations the mining and treatment of minerals may be conducted in a manner that will render practicable the future utilization of such ores or minerals or products as can not at the time be profitably utilized under then existing conditions.

On the whole there will be little occasion to appeal to legislation. The remedy for existing evils—and such evils do exist—must lie mainly along the lines of investigation, educational work, and the development of intelligent public opinion.

4. *By organization.*—This movement for conservation will be greatly facilitated by every State having its expert to look after and investigate its own minerals, soils, forests, water resources, and its agricultural interests, and if these experts can be constituted a State Commission on conservation of resources. The movement will be still further facilitated if these various State Commissions will cooperate with a national conservation commission in the solution of the general phases of these problems.

Back of each State commission and of the National commission the Governors of the several States, both by individual and joint action can exercise a most powerful influence in behalf of this movement; and it is certain that the press, the universities, and other great educational agencies of the country can be counted on to give the movement their vigorous and undivided support.

The question raised by the Governor of Indiana as to how we may conserve our mineral resources is still far removed from a complete answer. I have simply endeavored to indicate what seemed to me to be the true basis of conservation, and the lines along which progress may be made. The problem has many difficult phases; but this Conference is of itself the most convincing proof that the solution of these problems deserves and will receive the earnest consideration of the highest type of patriotic statesmanship and American business sense; and that its ultimate solution will be in accord with and in recognition of the rights and needs of the future as well as of those who constitute the present citizenship of the country.

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